

OCTOBER 1957—SIXTY FOURTH YEAR

# Machinery

*Long life accuracy*

IN MACHINE TOOL  
SPINDLES



**M-R-C**

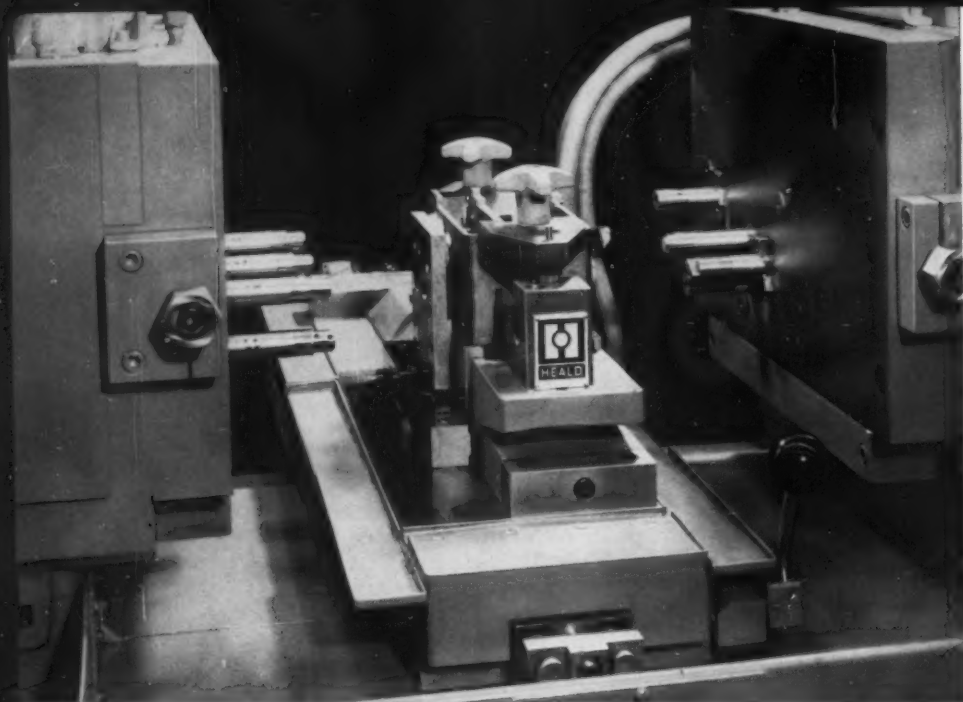
*Super-Precision*

BALL BEARINGS

are used in leading machine tool spindles operating successfully at 100,000 RPM and over. These spindles require the extreme accuracy and long life assured by M-R-C Super-Precision.

**MARLIN-ROCKWELL CORPORATION** Jamestown, New York

**MRC**  
BALL AND ROLLER  
bearings



## HOW TO BORIZE MULTIPLE HOLES ON CLOSE CENTERS in one fully-automatic cycle!

*New Multi-Spindle Boringheads  
make it as easy as A, B, C*

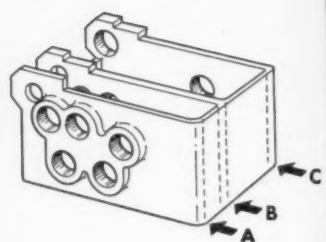
**P**RECISION boring of closely-spaced multiple holes used to be a slow and laborious job — done one-at-a-time on large, costly equipment that required highly-skilled operators. But not any more!

The new Heald Multi-Spindle Boringheads put high-precision, close-center borizing on a mass-production basis. Used with any Heald Bore-Matic, this Multi-Spindle head will precision Borize any practical number of holes, on centers as close as  $\frac{3}{4}$ ", at a single pass of the table — and duplicate the same operation again and again.

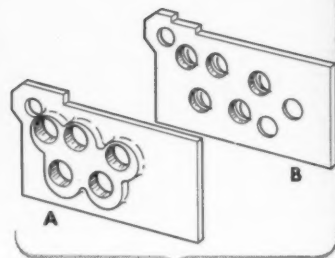
A Multi-Spindle head unit consists of a supporting frame which mounts interchangeable spindle plates, precision bored to receive the required number and arrangement of miniature precision Red-Head boringheads.

Any or all boringheads, including the smallest size,  $\frac{3}{4}$ ", can be provided with hydraulic cross-feed units operated from a single cylinder. Job changeover is simply a matter of switching spindle plates, and mounting the miniature boringheads required.

For the complete story on this important new development, send for Bulletin 2-021-022-1 Issue 1.



Holes Borized on Left End



Holes Borized on Right End

### HERE'S A GOOD EXAMPLE:

The Model 122 Bore-Matic shown above is equipped with Multi-Spindle Boringheads on both ends, to precision finish close-center bores in a small transmission housing. Each head consists of a group of miniature, precision Red-Head boringheads mounted on spindle plates that are jig bored for precise location of each Red Head. The setup shown, with 5 heads on the left and 4 on the right, is designed to bore and face 17 different holes. All operations are performed in a single, fully automatic cycle, with just one chucking of the work, and no indexing. The surfaces finished at each end of the machine are shown in the "exploded" part drawings above.

**IT PAYS TO COME TO HEALD**

**THE HEALD MACHINE COMPANY**

Subsidiary of The Cincinnati Milling Machine Co.

**Worcester 6, Massachusetts**

Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York





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# Machinery

OCTOBER 1957

VOL. 64 NO. 2

THE MONTHLY MAGAZINE OF ENGINEERING AND PRODUCTION  
IN THE MANUFACTURE OF METAL PRODUCTS

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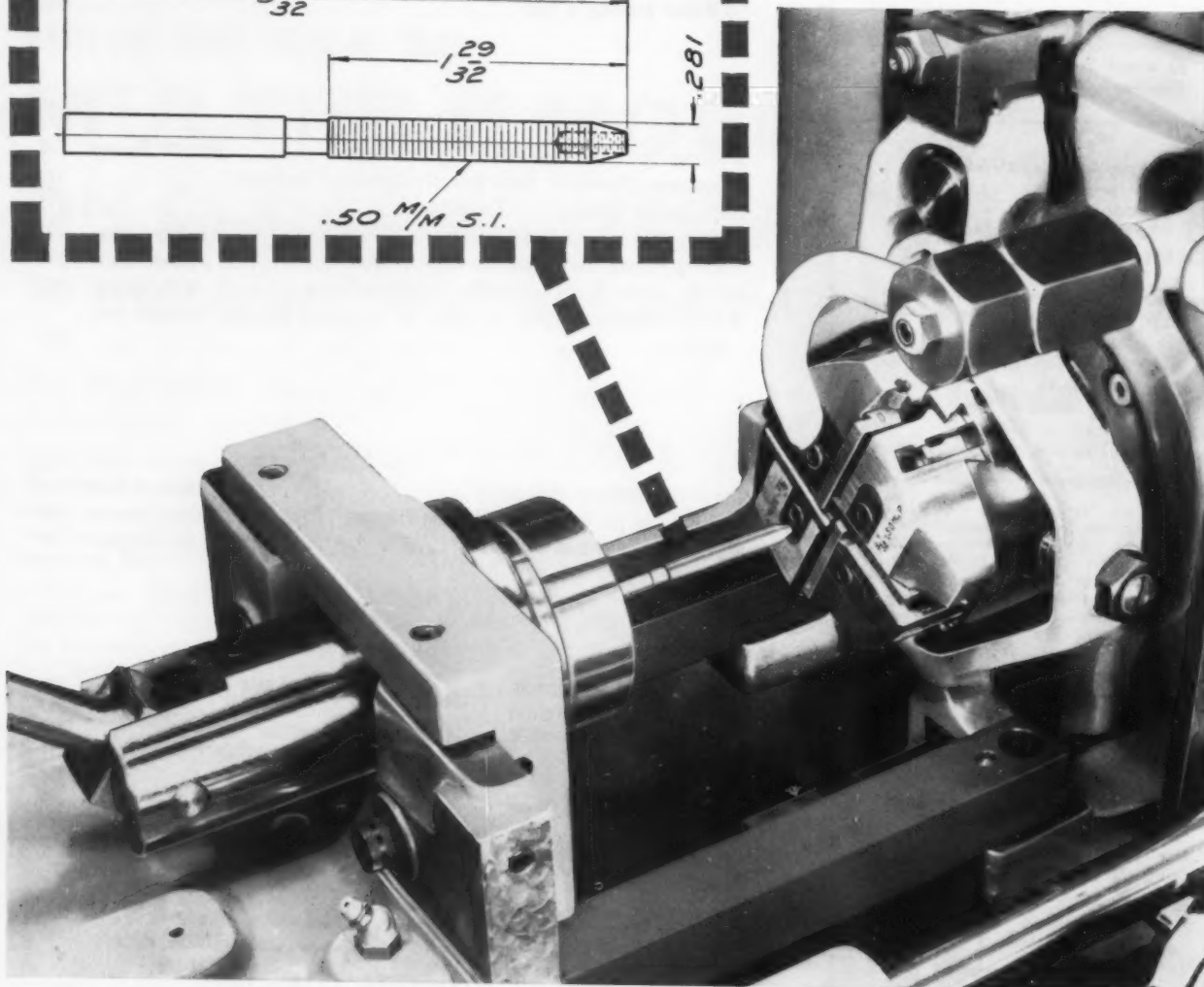
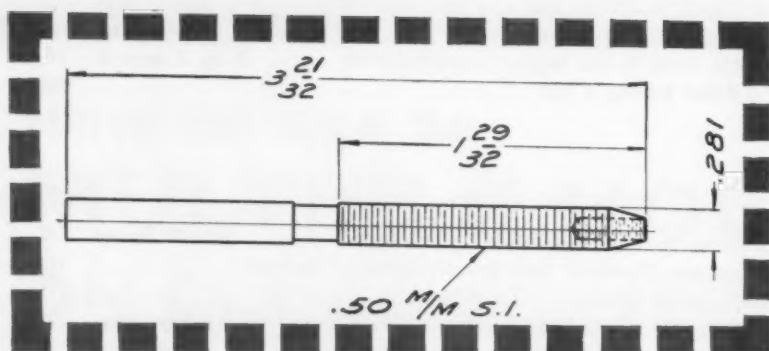
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# HIGH



# ~~SPEED~~ machine

## for small diameter precision threading

The 5C LANDMACO Lead Screw Machine is illustrated threading micrometer spindles at high speed to close tolerances at the Blanchard Engineering and Electric Company, Chicago, Illinois.

### SPECIFICATIONS:

Workpiece Material      Stress-proof steel (C1144)  
cold-drawn, strain-relieved, 260 to 280 Br.

#### Thread Specifications:

Diameter      .281"

Length      1-29/32"

Type      .50 M/M System International

Tolerance:      .2683-.2688" P.D., absolute  
concentricity and lead required.

Production:      195 per hour

Tool Life:      625 pieces—average  
between chaser grinds

The 5C ( $\frac{5}{8}$ ") LANDMACO Machine is a compactly-designed small machine for precision threading of parts ranging from #4 to  $\frac{5}{8}$ " in diameter. A 5VVV Lanco

Hardened and Ground Head is furnished as standard equipment to assure maximum accuracy—lead screw feed is optional. The die head is equipped with LANDIS Tangential Chasers which provide long life between grinds and can be reground for 80% of their original length.

8 spindle speeds ranging from 150 to 1000 RPM, automatic opening and closing of the die head, a hammer-blow handwheel to intensify vise gripping power, and carriage travel by means of a convenient operating lever are all features designed for operating ease and production efficiency. Air-operated carriage front and air-operated carriage return are available as extra equipment. In addition, there are a variety of special carriage fronts, such as the lever-operated collet front shown, for holding difficult-to-grip workpieces.

LANDMACO Machines are manufactured in models for threading all diameters from #4 to  $\frac{6}{8}$ ". Send us specifications of your workpiece... let us show you how a LANDMACO Machine will handle your threading operation efficiently and economically.

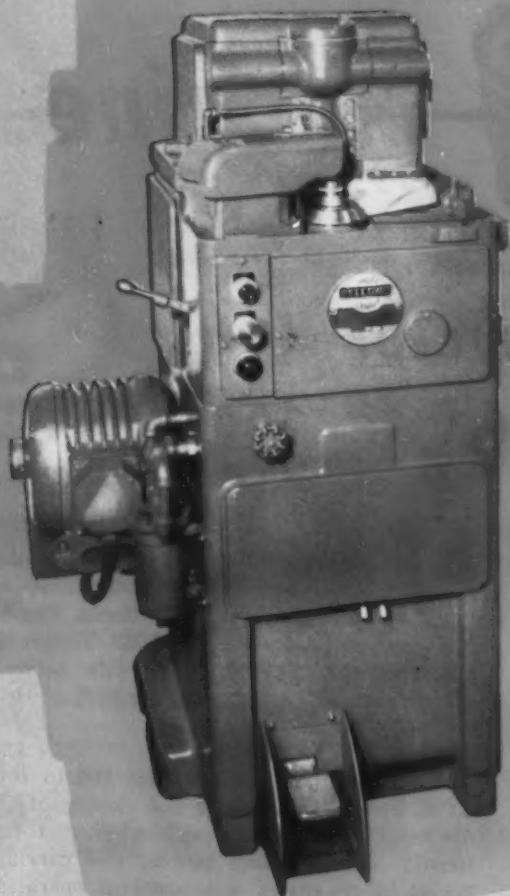
496C

**LANDIS Machine COMPANY**  
WAYNESBORO • PENNSYLVANIA

*the world's largest manufacturer of threading equipment* CUTTING • GRINDING • ROLLING • TAPPING

# Lowers Pinion

WITH FELLOWS



**FELLOWS 3' FINE-PITCH  
GEAR SHAPER**



*Speed and accuracy of the new 3" machine increased production of this pinion from 55 per hour to 120.*

THE  
PRECISION  
LINE



# Production Cost from 16.9¢ to 6¢ each!

## FINE-PITCH PRODUCTION EQUIPMENT



*Fellows No. 4 Fine-Pitch Red Liner Inspection Instrument gives proof of accuracy.*

Here's an example that shows how Fellows machines pay off in lowered gear production costs. This small pinion is manufactured for a major instrument maker on a Fellows 3" Fine-Pitch Gear Shaper.

Production is 120 pinions per hour, more than twice the production of previous machines. In addition, pieces are automatically deburred, eliminating an operation. *Result:* the cost per pinion is 10.9 cents lower than before!

Fellows 3" Fine-Pitch Gear Shaper cuts within close tolerances at speeds up to 2,000 strokes per minute. The Fellows No. 4 Fine-Pitch Red Liner inspection instrument gives chart-recorded, permanent proof of the accuracy of the product.

For full information about the Fellows Precision Line of gear production equipment — from 1/16" P.D. to 120" P.D. — contact your Fellows representative. Write, wire, or phone any Fellows office.

THE FELLOWS GEAR SHAPER COMPANY,  
78 River Street, Springfield, Vermont.

Branch Offices:

1048 No. Woodward Ave., Royal Oak, Mich.

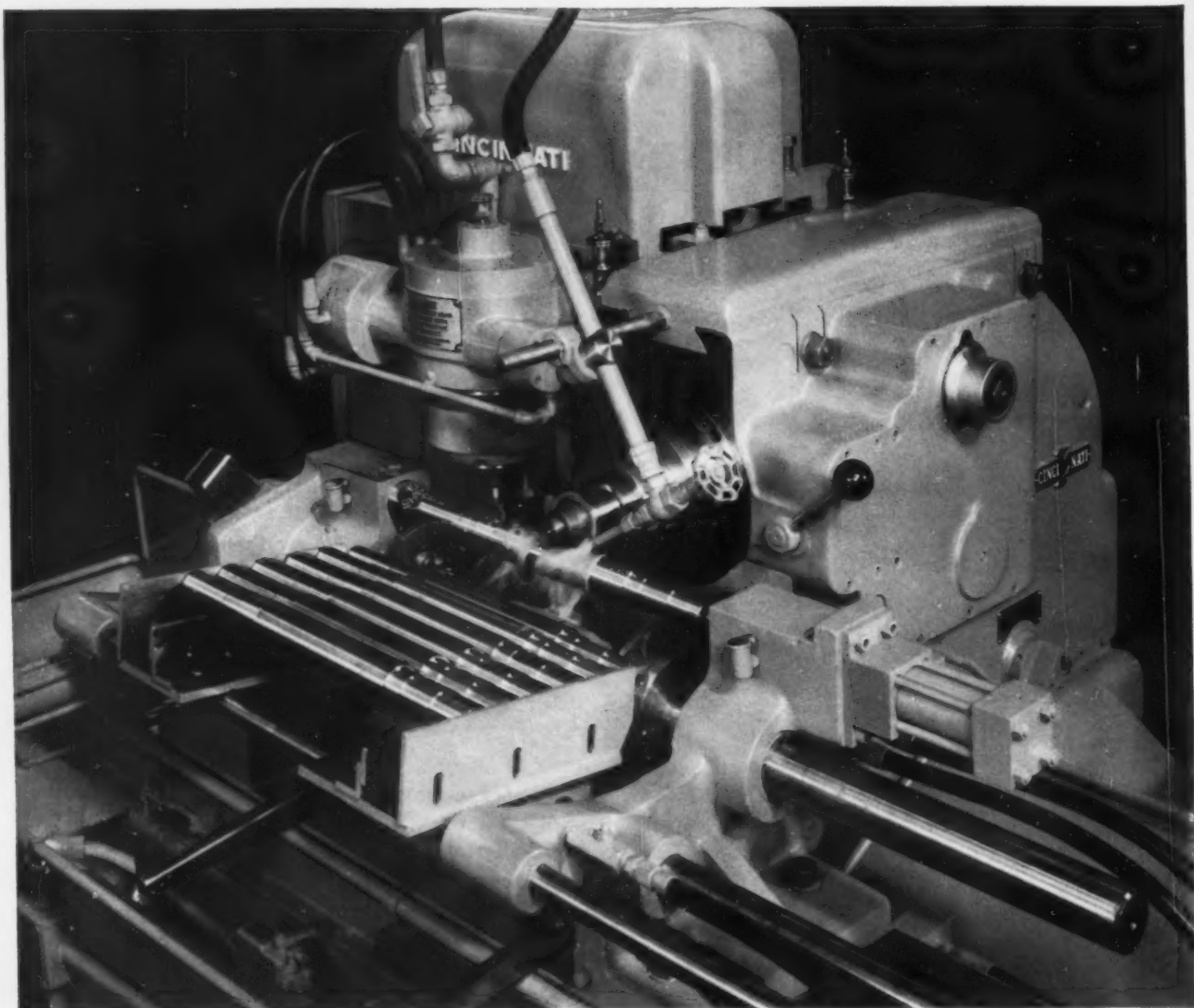
150 West Pleasant Ave., Maywood, N. J.

5835 West North Ave., Chicago 39

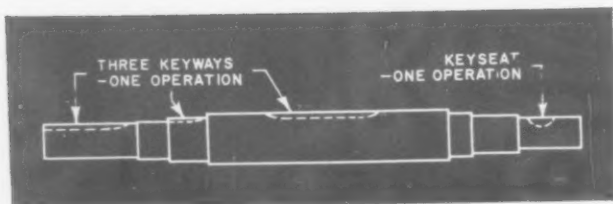
6214 West Manchester Ave., Los Angeles 45

# *Fellows* Gear Production Equipment

# POWERMATIC



Automatic four-position turret stop (left of cutter) determines depth of keyways milled in various diameters on motor shafts. This unit is attached to the spindle carrier of a Rise-and-Fall Powermatic Milling Machine.



One of the many shafts milled on the CINCINNATI Powermatic illustrated here.

Production:

keyseat, 220 per hour

keyways, 68 per hour

**MILLING MACHINES • BROACHING MACHINES • CUTTER AND TOOL GRINDERS • SPECIAL MACHINE**

# equipped for automation

## ... handles small lots having various requirements

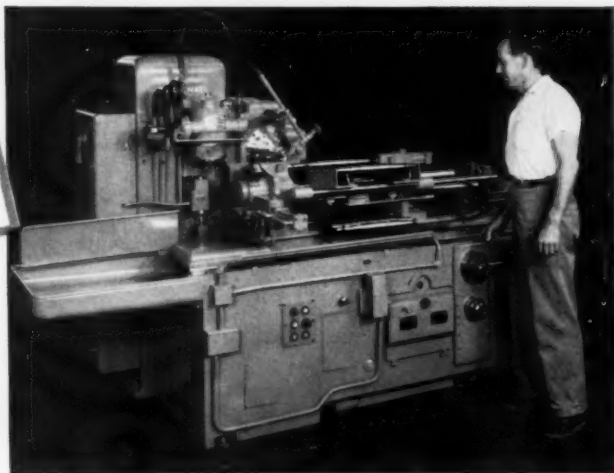
A manufacturer of electric motors wanted to gain the maximum benefits from automation in milling the keyways in motor shafts. However, there were two tough problems to solve: 1) shafts are produced in several sizes and manufactured in small quantities, and 2) number and size of keyways vary with each shaft. Cincinnati Automation Specialists, experienced in automatic production long before the word "automation" was coined, decided that the job could be handled at the lowest cost on a CINCINNATI® Plain Rise-and-Fall Powermatic equipped with a universal fixture. This machine has a unique feature—cycle selector—which controls the automatic cycle of the machine and other functions of automation assignable to it. And cycle selectors can be interchanged within a minute or less. ¶ Shafts vary from 1" diameter

by 11" long, to 3½" diameter by 30" long. Each shaft requires one keyseating operation, and two, three or four keyways. Depth of cut for the size of keyway desired is automatically controlled by a four-position turret stop, operated by the machine cycle selector. A hydraulically actuated magazine type loading fixture, with interchangeable elements, is also automatically controlled by the cycle selector. ¶ This is but one of many examples of Cincinnati Engineering Service in the field of low-cost automation for small quantities. Our engineers can do a comparable job for the family groups of parts manufactured in your shop. Give us complete information; we will work out a solution.

**Special Machine Tool Division**  
**THE CINCINNATI MILLING MACHINE CO.**  
**CINCINNATI 9, OHIO**



Automation for small manufacturing quantities incorporates automatic loading and automatic machine cycling on this CINCINNATI Powermatic Rise-and-Fall Milling Machine. Write for catalog No. M-1913-1. Brief specifications in Sweet's Machine Tool File.



# CINCINNATI

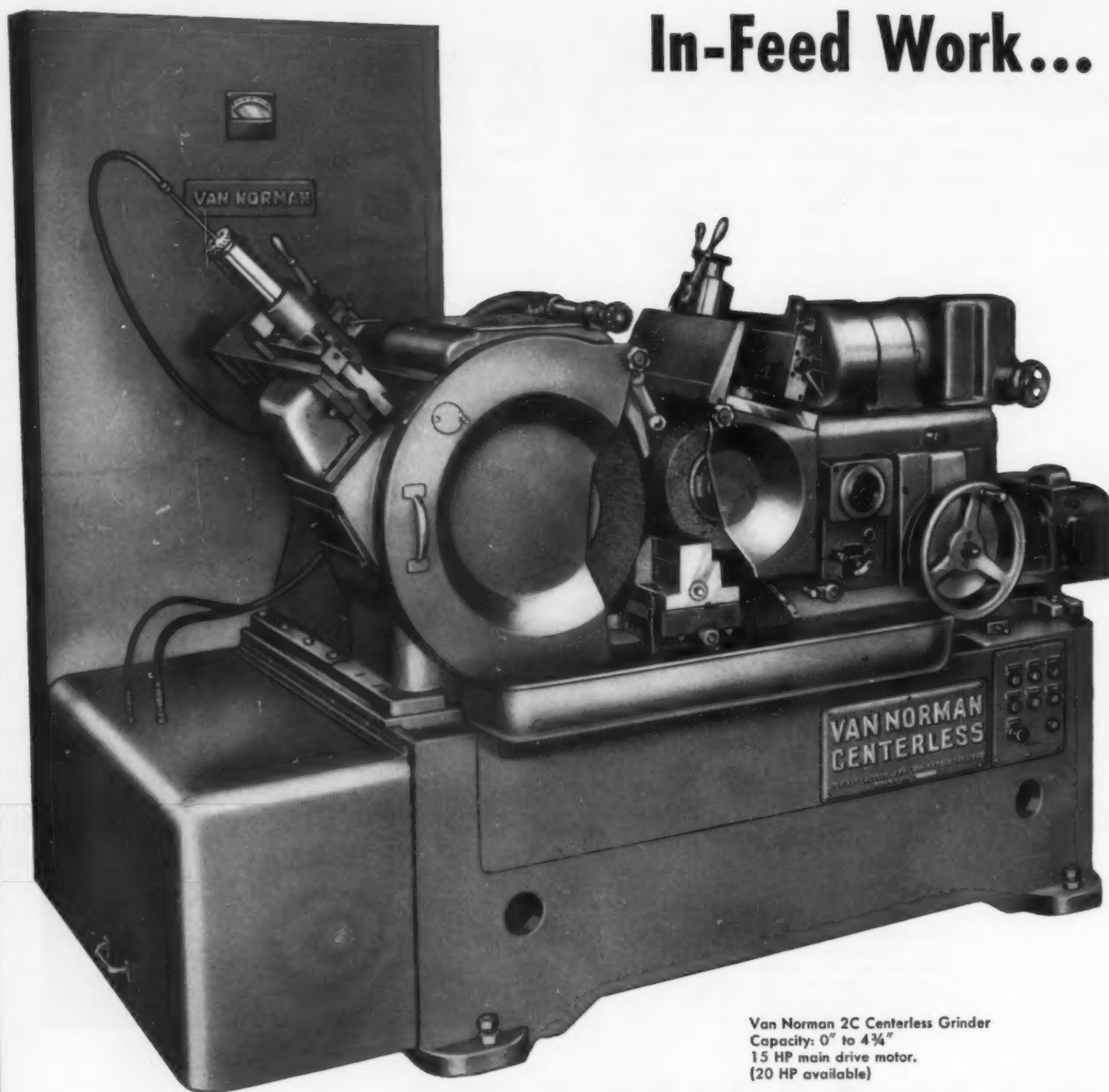


TOOLS • METAL FORMING MACHINES • HARDENING MACHINES • CUTTING FLUID • GRINDING WHEELS

For more information fill in page number on Inquiry Card, on page 237

MACHINERY, October, 1957—7

Now you can do: Thru-Feed Work...  
In-Feed Work...



Van Norman 2C Centerless Grinder  
Capacity: 0" to 4 3/4"  
15 HP main drive motor.  
(20 HP available)

## **VAN NORMAN MACHINE**

MANUFACTURERS OF — Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.



**...Form Grinding...Profile Work...**

**with  
ONE**

## **VAN NORMAN 2C Centerless Grinder**

Featuring a 15 HP main drive motor which provides ample power for every grinding job, the Van Norman 2C Centerless Grinder actually gives you the facilities of 3 centerless grinders . . . standard grinding for thru-feed work . . . standard grinding for in-feed jobs and, equipped with crush dressing attachment, form grinding and profile work.

Get complete details on this newest in the expanding line of Van Norman grinders. Write, wire or telephone today for descriptive catalogs.

**Check these features of the  
Van Norman 2C Centerless Grinder:**

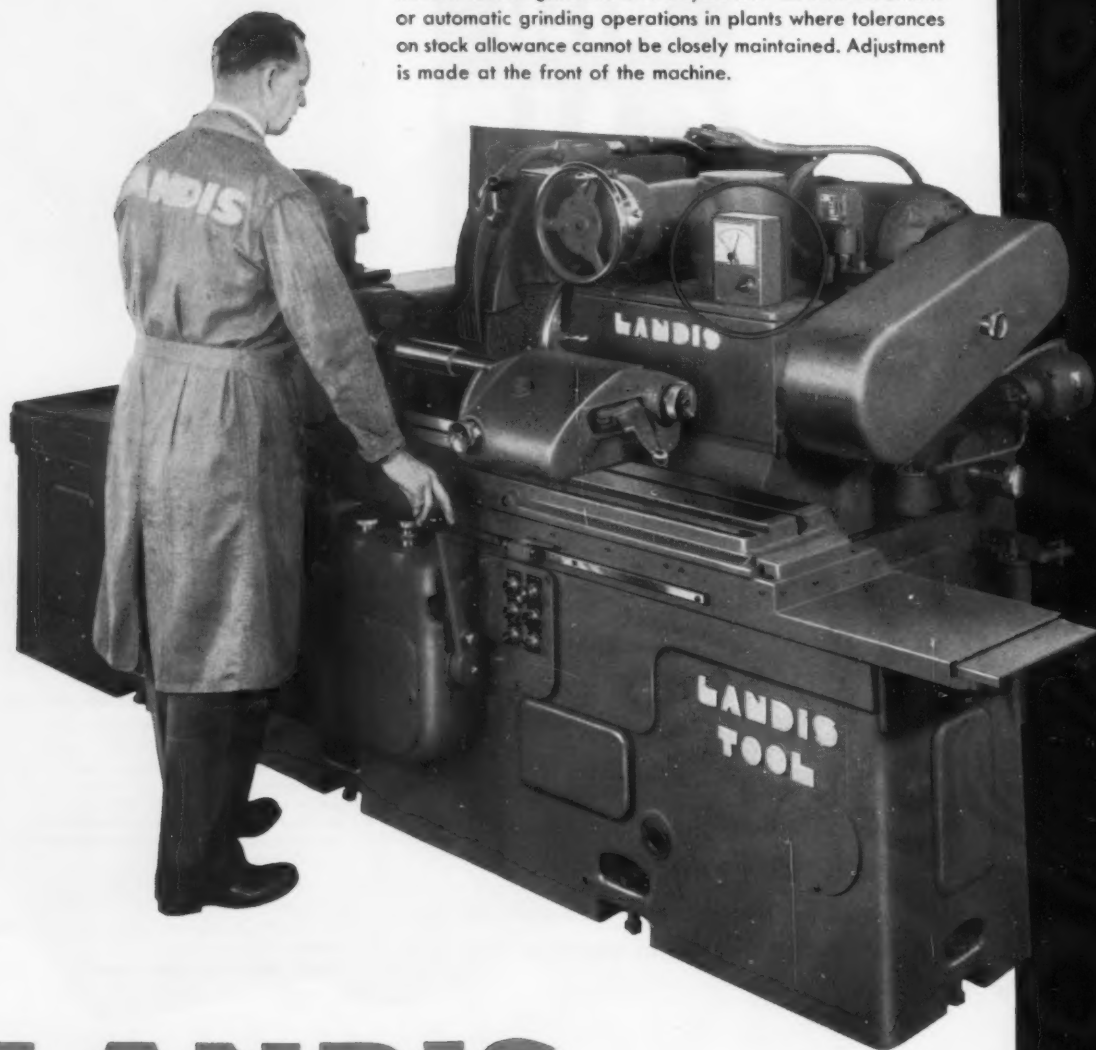
- ✓ Hard chrome plating of regulating wheel slide preserves original factory built-in accuracy.
- ✓ Grinding wheel and regulating wheel spindles are of a unit type construction . . . totally enclosed with double-row super-precision bearings, sealed and lubricated for life — assuring rigidity and accuracy previously unobtainable in centerless grinding, vibrationless operation.
- ✓ Spindles require no warm-up period, eliminating "creep."
- ✓ Infinitely variable regulating wheel drive.
- ✓ Combination straight and profile hydraulic wheel dressers for each wheel.
- ✓ **Crush dressing attachment**

**COMPANY**  
**SPRINGFIELD 7,  
MASSACHUSETTS**

Don't wait . . . for extra profit install a Van Norman machine now! They are available in many purchase plans . . . Outright sale . . . Purchase on conditional sales contract up to five years . . . Pay as you depreciate . . . up to 10 years.

# New Landis automatic Wheel Approach Control saves valuable production time

Landis automatic Wheel Approach Control is now available on new Landis grinders. It cuts cycle time on semi-automatic or automatic grinding operations in plants where tolerances on stock allowance cannot be closely maintained. Adjustment is made at the front of the machine.



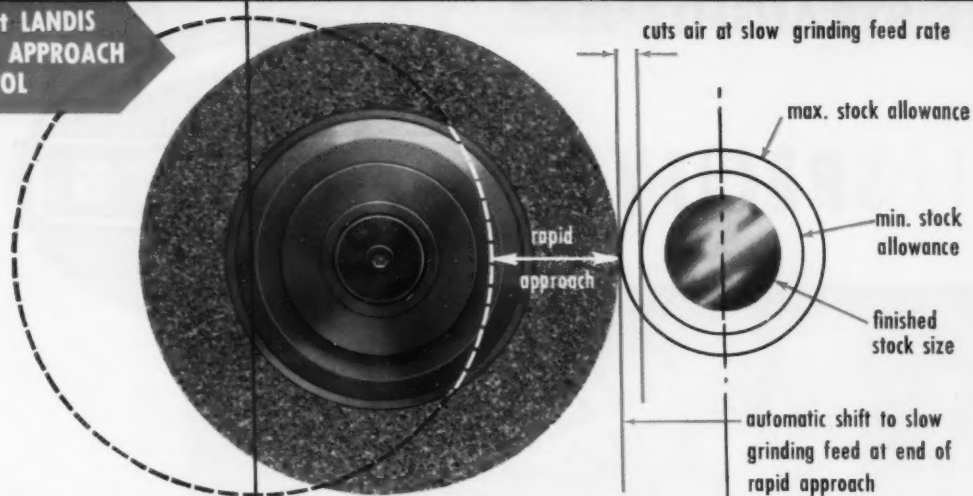
# LANDIS

precision grinders

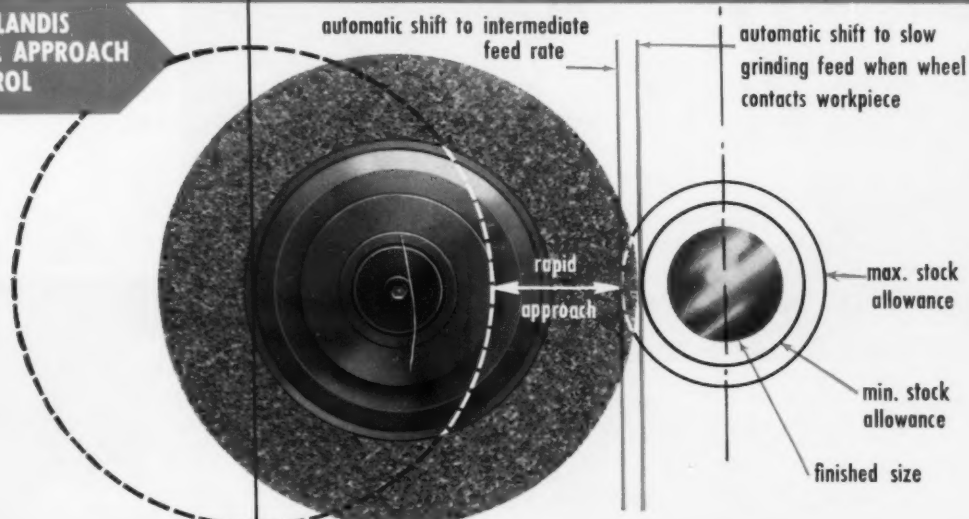
LANDIS TOOL COMPANY / WAYNESBORO, PENNSYLVANIA

**this is how LANDIS WHEEL APPROACH CONTROL works**

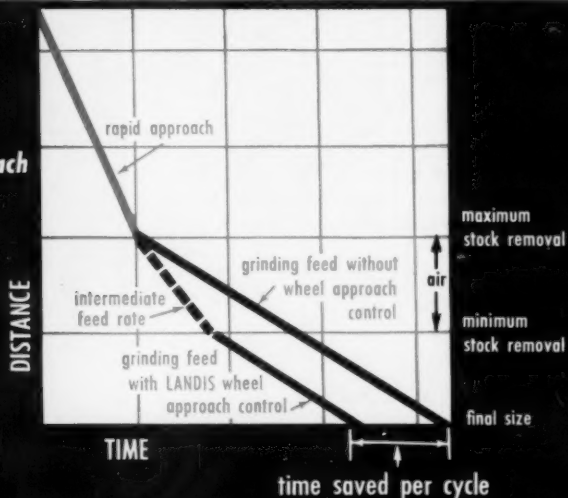
**without LANDIS  
WHEEL APPROACH  
CONTROL**



**with LANDIS  
WHEEL APPROACH  
CONTROL**



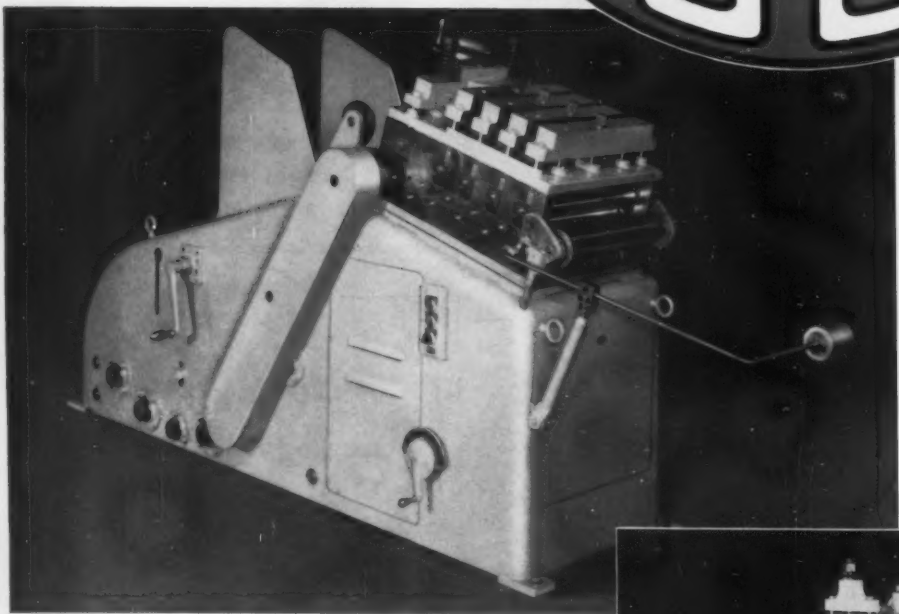
**how LANDIS automatic wheel approach  
control saves production cycle time**



**STOCK REELS • SLIDE FEEDS • COIL CRADLES**

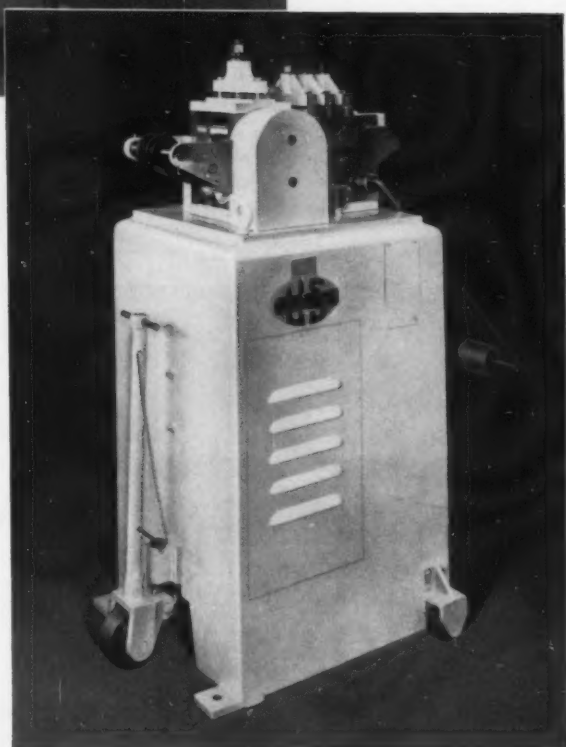
**WIRE STRAIGHTENERS**

**SPECIFY**



Above—Model PDSC-1648 U. S. Combination Coil Cradle—Power Driven Straightener, suitable for material up to 16 inches in width, coils with O.D. up to 48 inches, thickness capacity 1/8 inch.

Right—Model PDS-4 1/2 U. S. Power Driven Straightener, suitable for material up to 4 1/2 inches in width, thickness capacity 1/8 inch.





# **FLAT STOCK STRAIGHTENERS • STOCK OILERS ROLL FEEDS • SCRAP CHOPPERS • MULTI-STOPS FOR PROFITABLE COIL HANDLING**

Units in the line of U. S. Automatic Press Room Equipment are designed to help you reduce stamping costs through the efficient use of stock in coils. Where floor space is at a premium, a unit like the Model PDSC-1648 Combination Coil Cradle—Power Driven Straightener, shown on the opposite page, can often be used in an area too small to accommodate a separate Straightener and Cradle.

Satisfactory feeding into the press is often dependent upon: (1) the straightness of the stock, and (2) the manner in which the coil is supported and unwound. U. S. Stock Reels, Coil Cradles and Combination Units are built in a wide range of sizes and types to suit your particular requirements.

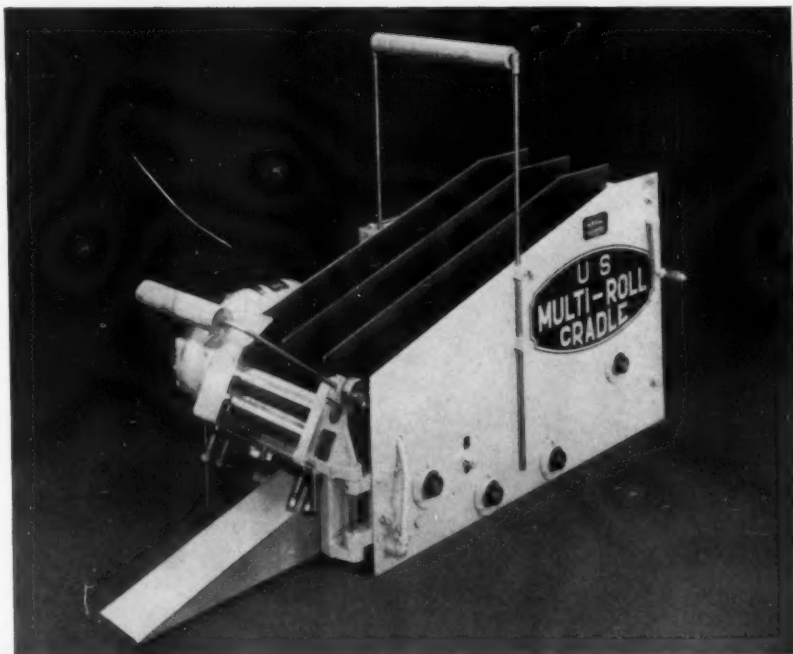
Ask for Bulletins 80-M and 95-M for detailing information on units in the line of U. S. Automatic Press Room Equipment.

## **U. S. TOOL COMPANY, Inc.**

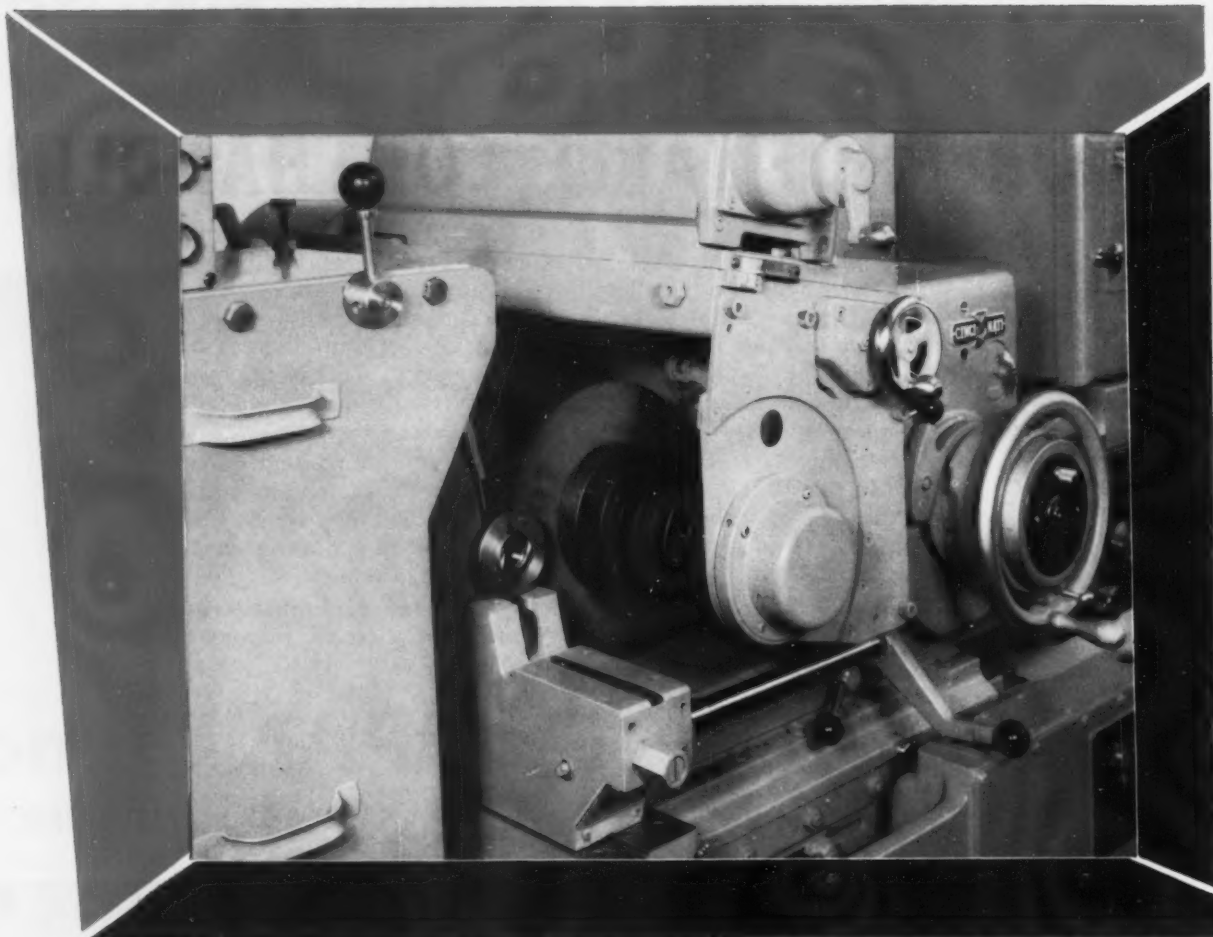
**AMPERE (East Orange)**

**NEW JERSEY**

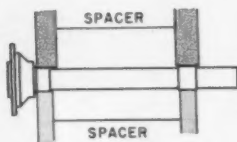
Right—Model ACC-1-9-C U. S. Multi-Roll Coil Cradle suitable for material up to 9 inches in width, O.D. up to 40 inches, weight capacity 1,500 lbs.



# Nonproductive Chores



Several automatic features incorporated in this CINCINNATI FILMATIC No. 2 Centerless Grinder reduce nonproductive time in centerless grinding two diameters on turbine shafts.



Drawing of part showing diameters ground.

**Production Data:**

Part name ..... Turbine shaft  
Material ..... Steel  
Stock removal ..... .010"  
Production ..... 150 parts per hour

# CINCINNATI

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES • ROLL GRINDING MACHINES • SURFACE

# are Automatic on this Cincinnati Centerless

Give the operator an assist with nonproductive chores and he'll accomplish more. One way to do it is to *automate* as many nonproductive elements as possible in the cost of machining. Cincinnati grinding specialists proceeded along these lines in equipping a CINCINNATI® FILMATIC No. 2 Centerless to grind two diameters on turbine shafts. Automatic features for reducing nonproductive time include:

Automatic profile truing for grinding wheel, including cycle counter

Automatic grinding wheel balancing

Automatic grinding wheel reciprocating, with truing interlock

Automatic Electro-Hydraulic Infeed

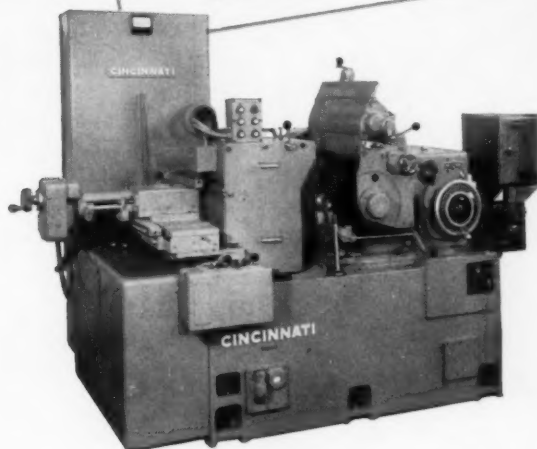
These cost-reducing features are in addition to well-known Cincinnati advantages such as bed rock mounting of grinding wheel spindle; FILMATIC grinding wheel spindle bear-

ings; double slide support for the regulating wheel unit. Cincinnati is unquestionably the best buy for your precision centerless grinding work. Get additional details by asking for catalog No. G-644-2, or look in Sweet's Machine Tool File for brief specifications.

**CINCINNATI GRINDERS INCORPORATED**  
**CINCINNATI 9, OHIO**



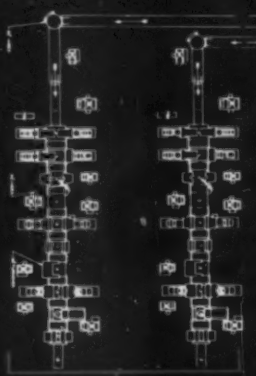
**CINCINNATI FILMATIC**  
**No. 2 CENTERLESS**  
**GRINDING MACHINE**  
Catalog No. G-644-2



**GRINDING MACHINES • CHUCKING GRINDERS • MICRO-CENTRIC GRINDING MACHINES • CENTERLESS LAPPING MACHINES**

For more information fill in page number on Inquiry Card, on page 237

MACHINERY, October, 1957—15



#### SECTION VI

Blocks enter with ends exposed. After tapping ends and top, they are rotated to car position for tapping banks and sides. Final position is bottom up for tapping pan rail and under banks.

#### SECTION V

Valve lifter holes are drilled, rough reamed, finish reamed and inspected.

#### SECTION IV

With blocks in car position, mounting pads are milled, cylinder head bank faces are drilled, chamfered and counterbored and deep oil holes are drilled.

#### SECTION III

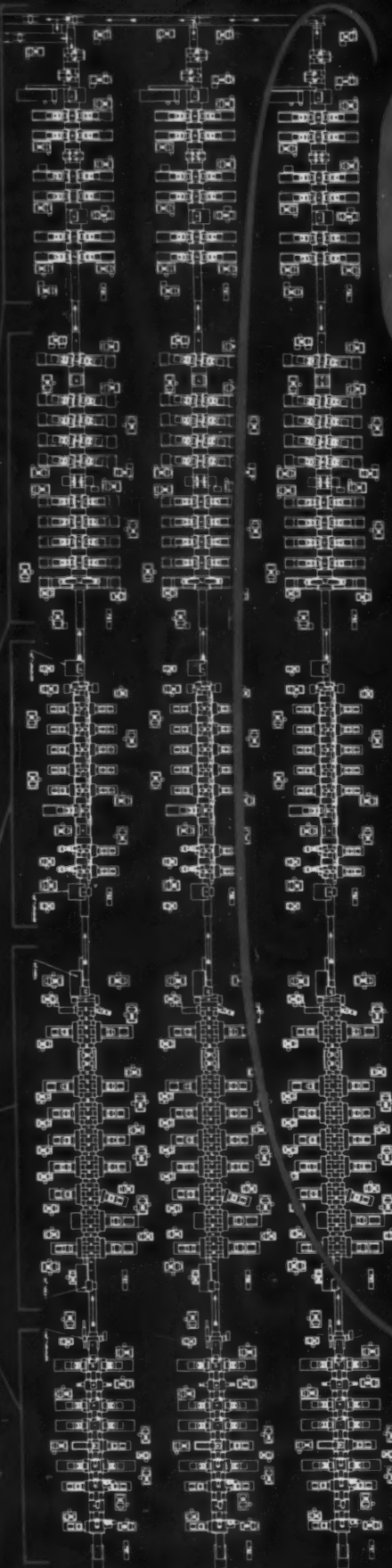
Blocks are turned on sides. Then distributor hole is rough and semi-finish bored, all holes in top are drilled and chamfered and crankshaft bearing cap holes and oil holes are drilled in bottom.

#### SECTION II

Blocks are turned 90 degrees, all holes in ends are drilled and chamfered, three oil gallery holes are pressure tested and cam shaft bearing diameters are rough bored. Then blocks are turned to car position.

#### SECTION I

Blocks enter bottom up. Oil pan screw holes are drilled, transfer spots are machined in pan rail, under banks are drilled and chamfered and blocks are turned to car position.



LINE C

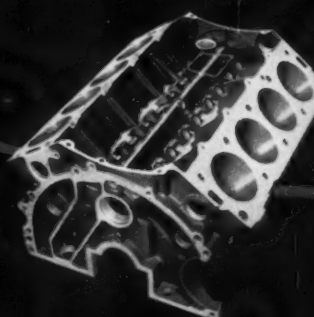
LINE B

LINE A

# 1300 ft. Transfer-matic Performs 2291 Operations on V-8 Blocks

Here is the answer to the automobile industry's insistent request for machine tools which will reduce the cost of model changes and shorten change-over periods. This giant "Sectionized" Transfer-matic is constructed with an entirely new set of Cross building blocks and applies new concepts of standardization to machine bases, transfers, fixtures and heads.

- ★ Capacity to machine any passenger car engine block.
- ★ 270 stations in 17 sections, each with independent controls; sections operate automatically as blocks are made available; any section may be stopped without interrupting production of others.
- ★ 2291 operations on 185 blocks simultaneously.
- ★ Rated capacity of 350 cylinder blocks per hour.
- ★ Cross Machine Control Units with Toolometers for efficient tool programming.
- ★ Pre-set tools to reduce downtime.







*Another Automation First by Cross*

Photo shows  
Sections II, III, IV  
and V of Line A.

Established 1898

THE **CROSS** CO.  
*First in Automation*  
PARK GROVE STATION • DETROIT 5, MICHIGAN



## BALANCED ACTION TAPS take tough jobs in their stride . . .

Taps built with Balanced Action work *with* the job, not *against* it. They smooth out production flow—even with hard-to-tap metals—insure hole-accuracy—and prolong useful tap life.

Winter gages, plug and ring, thread and plain are also made with "Balanced Action" accuracy.

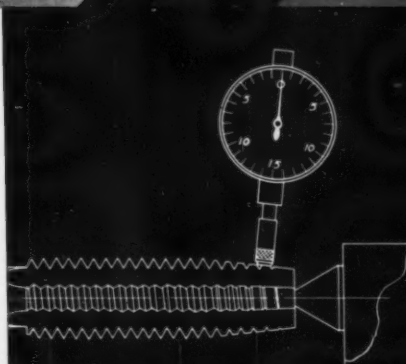
CALL YOUR WINTER DISTRIBUTOR



## WINTER BROTHERS COMPANY

Rochester, Michigan, U.S.A.

Distributors in principal cities. Branches in New York • Detroit • Cleveland • Chicago • Dallas • San Francisco • Los Angeles  
Division of National Twist Drill & Tool Co.



### ACCURATE AND CONCENTRIC CHAMFERS:

By holding shank, chamfer, and thread concentricity to very close limits, hole-accuracy with Balanced Action taps is assured.



EXACT FLUTE SPACING



PRECISION CHIP  
DRIVER CONTOURS



UNIFORMITY OF  
FLUTE CONTOURS



## Research that anticipates new and unusual cutting problems

In many tool applications, National's continuing program of basic research has brought about significant improvements in the service life of National products.

National users who are faced with new or unusual cutting problems are invited to call upon our research staff for assistance and advice.



CALL YOUR  
NATIONAL DISTRIBUTOR

### NATIONAL TWIST DRILL AND TOOL COMPANY Rochester, Michigan, U.S.A.

Distributors in principal cities. Branches in New York • Detroit • Cleveland • Chicago • Dallas • San Francisco • Los Angeles



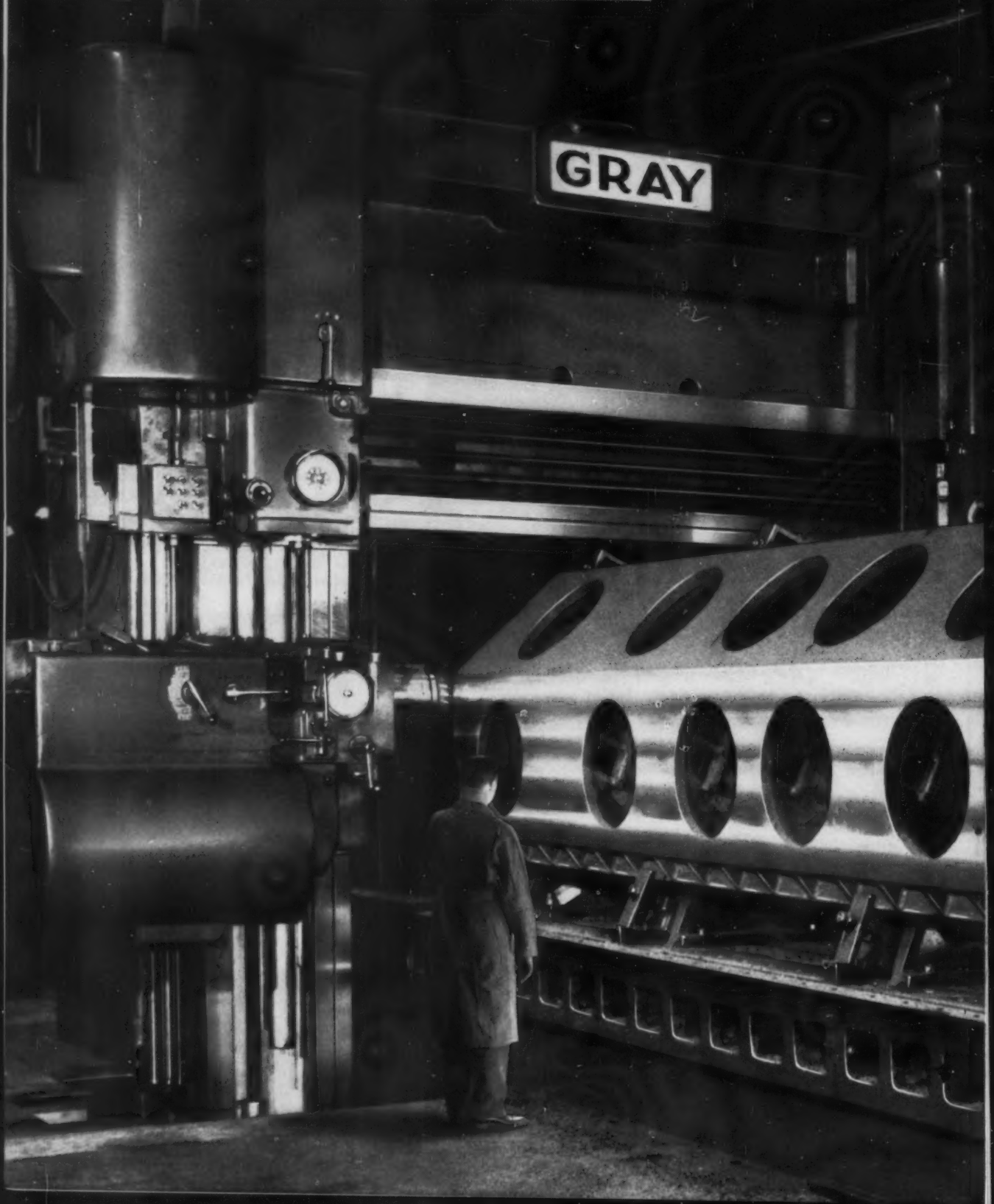
**The search that never ends.**  
Unparalleled research facilities available.



# National

TWIST DRILLS • REAMERS • COUNTERBORES • MILLING CUTTERS • END MILLS • HOBBS • CARBIDE AND SPECIAL TOOLS

***backbone*** of a





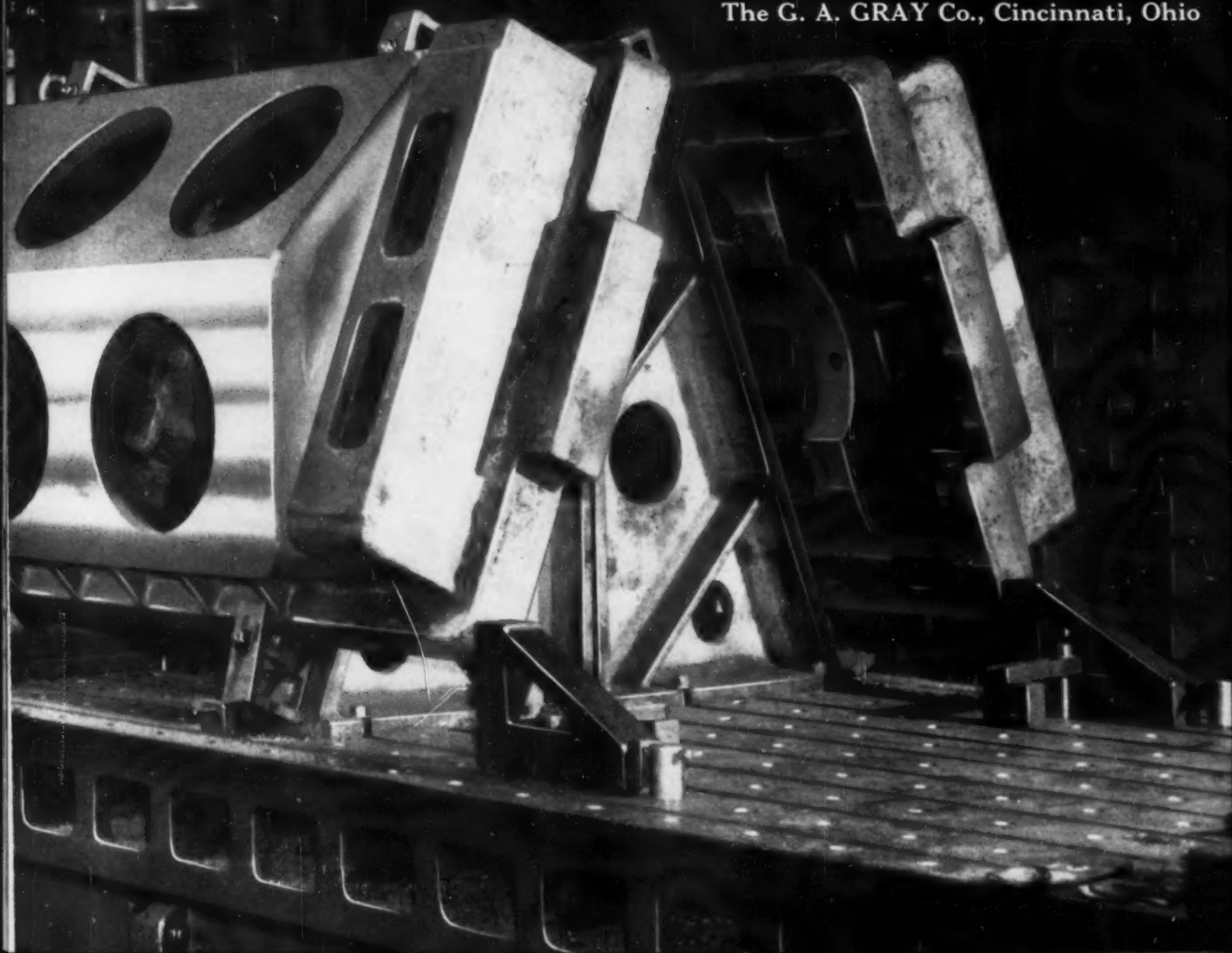
# modern shop a GRAY

Gray unit head planer type millers dominate the field of heavy duty milling. This 96" x 96" x 26' monster can simultaneously deliver over seventy-five horsepower to each of its four cutters. A total of over 300 horsepower cuts a big job down to size in a hurry.

A simple ever present pendant control encourages maximum efficiency right up to the closing bell. No longer is the operator a workman—he's a pilot.

All this, plus mirror smooth surfaces milled to precise tolerances, maintain the Gray reputation for top quality the world over.

The G. A. GRAY Co., Cincinnati, Ohio



# ARMSTRONG

*Quality*

## TOOLS



### More than meets the eye

There are extra values in ARMSTRONG TOOLS that become apparent only with use.

**TOOL SENSE**—convenience in use—the most efficient "*tool approach*" built into ARMSTRONG Tool Holders; the balance and "*feel*" of an ARMSTRONG Wrench; the *rigidity* of ARMSTRONG "C" Clamps; the extra *toughness* of ARMSTRONG Lathe Dogs and Eye Bolts; the universal *adaptability* of ARMSTRONG Set-up and Hold-down Tools—the evidence of "tool sense", the understanding of each tool's requirements.

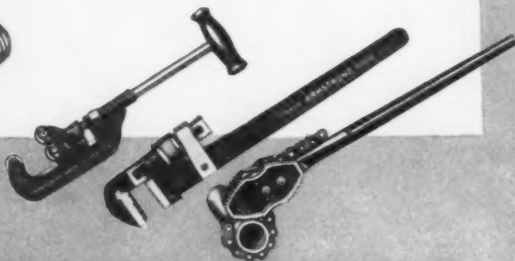
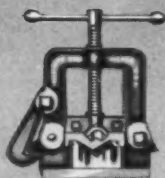
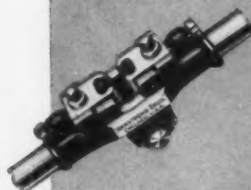
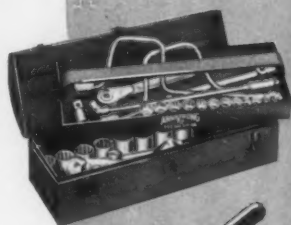
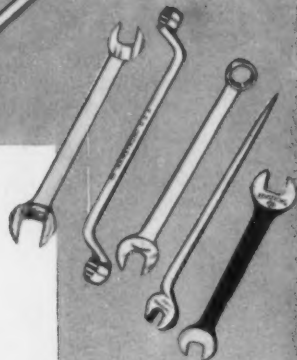
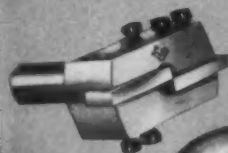
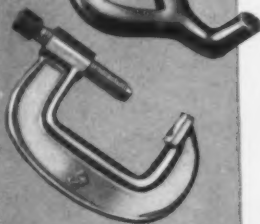
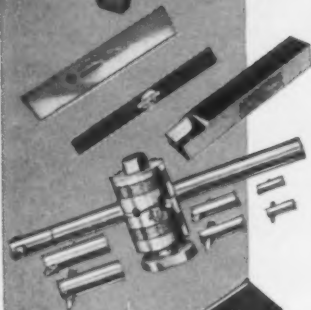
**STRENGTH**—built into each individual ARMSTRONG TOOL is a safety factor of extra *strength*—*strength* beyond any need, the inherent strength of specially selected materials enhanced by proper heat treatment and hardening.

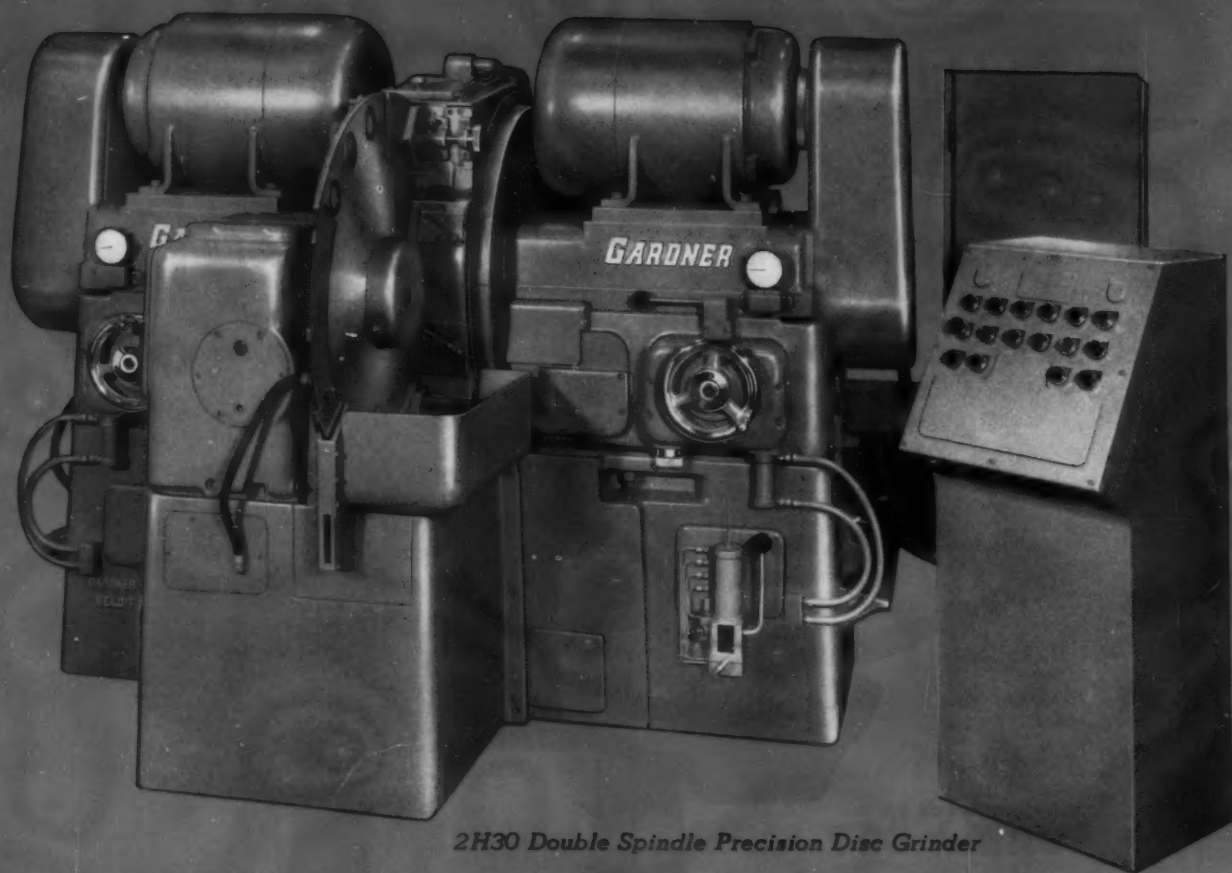
**UNIFORM QUALITY**—the uniform quality made possible by modern manufacturing methods, in a specially-built plant equipped with every needed quality control. The name ARMSTRONG with the Arm-and-Hammer Trade Mark is universally recognized as a guarantee of finest quality.

### ARMSTRONG BROS. TOOL CO.

*"The Tool Holder People"*

5213 WEST ARMSTRONG AVE. • CHICAGO 30, ILLINOIS

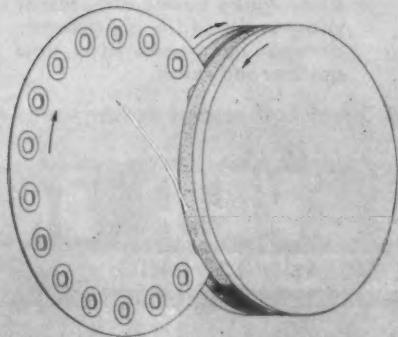
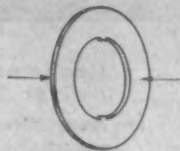




## Production report on new Gardner Disc Grinder:

## Grinds 2100 thrust washers per hour

**TWO** parallel surfaces ground  
in **ONE** operation



New design of 2H30 with heavier construction and greater stability produces faster and to closer tolerances . . .

**production data:**

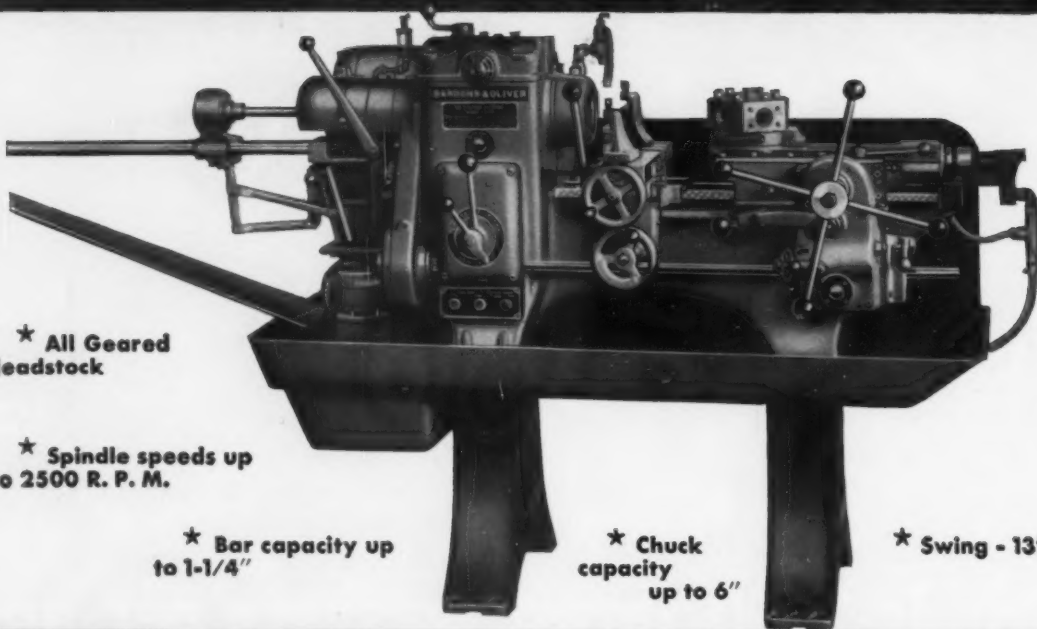
Workpiece:	Mild steel thrust washer: hardened; 3.00" O.D. x 1.75" I.D. x 0.093" thick
Rate:	2100 parts per hour
Stock Removal:	.005" overall 1st cut .002" to .003" overall 2nd cut
Tolerances:	Flatness..... .0001"-.0003" Parallelism..... .0001"-.0004" Uniformity..... .002"

***GARDNER***  
precision disc grinders  
BELOIT, WISCONSIN

The **BARDONS & OLIVER**

**No. 2** GEARED  
ELECTRIC

## Turret Lathe Handles **BOTH** BAR and CHUCK WORK



★ All Geared  
Headstock

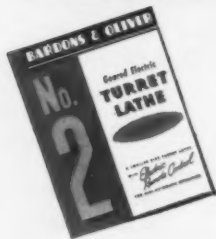
★ Spindle speeds up  
to 2500 R. P. M.

★ Bar capacity up  
to 1-1/4"

★ Chuck  
capacity  
up to 6"

★ Swing - 13"

Why buy two Machines ... When **ONE** will  
do the Job?.. Check these *Outstanding Features*



Write For New Catalog  
On Your  
Company Letterhead

- ◆ Only tenths of a second for spindle reversing and two to one speed changing.
- ◆ Permissible spindle reversals up to 10 cycles per minute.
- ◆ Twelve unduplicated quick speed changes in several optional ranges.
- ◆ Instantaneous Dynamic spindle brake.

- ◆ Headstock redesigned to deliver 25% more power.
- ◆ Automatic spindle reverse and speed change actuated by the operating cycle of the hexagon turret (optional extra).
- ◆ Redesigned heavy duty turret slide and saddle for greater accuracy, longer life, and quicker indexing.

Manufacturers of a complete line of Turret Lathes and Cutting-off Lathes

# BARDONS & OLIVER, INC.

1135 WEST 9TH STREET

• CLEVELAND 13, OHIO





## Another score for you...and Cimcool

You'll score many an inside-the-plant home run . . . increasing production and lowering costs . . . when you let CIMCOOL® go to bat for you. CIMCOOL Concentrate is the largest selling chemical cutting fluid in the world. Here's how this radically new and different cutting fluid can win for your production team!

**CIMCOOL LOWERS COSTS** because it's longer lasting in machines. Thus, it reduces downtime and cuts costs for cleaning and changing.

**CIMCOOL DOES A BETTER JOB** because of its chemical lubricity. It permits faster speeds and feeds, for it combines friction reduction and cooling capacity in a degree never before attained by old-fashioned coolants.

**CIMCOOL IS CLEAN**, doesn't soil clothing or hands. It contains no skin irritants. It leaves no slippery film on shoes, floor, machine or work. It can't smoke, can't burn, and virtually eliminates rancidity and foul odors.

Your CIMCOOL Distributor has valuable teamplay tips for you. He'll give you complete information on CIMCOOL Concentrate—and the entire family of CIMCOOL Cutting Fluids. Or contact us direct. We'll have one of our Cincinnati Milling-trained machinists call on you—without cost or obligation. Write, wire or telephone Sales Manager, Cincinnati Milling Products Division, Cincinnati 9, Ohio.

®Trade Mark Reg. U.S. Pat. Off.

### CIMCOOL CUTTING FLUIDS

**CIMCOOL Concentrate**—The famous pink fluid which still covers 85% of all metal cutting jobs. Effective, economical and clean.

**CIMCOOL Tapping Compound**—Permits the use of highest tapping speeds and increases tap life amazingly.

**CIMPLUS** The transparent grinding fluid with exceptional rust control. Also used for machining cast iron and as a water conditioner with CIMCOOL Concentrate.

**CIMCUT Concentrates** — For jobs requiring oil-base cutting fluids. Added to mineral oils, they give economical mixes for higher speeds and feeds.

**CIMCOOL Bactericide** — The most effective agent yet developed to overcome rancidity and foul odors.

**CIMCOOL Machine Cleaner** — The two-phase non-corrosive cleaner that removes grit, dirt, slime and oil.

# CIMCOOL

## Cutting Fluids

*for 100% of all metal cutting jobs*

PRODUCTION-PROVED PRODUCTS OF THE CINCINNATI MILLING MACHINE CO.





# Giddings & Lewis high-speed 10-inch quill HYPRO PLANER-MILLERS

You get *power plus ultra-precision* milling with four 50-hp water-cooled head motors . . . *proven design* features . . . *advanced engineering* in the revolutionary G&L 10-inch quill HYPRO planer-type milling machine. Outstanding features that assure *greater productivity* are:

**HYDRAULIC COUNTERBALANCE SYSTEM** for removing the *entire* weight of the rail milling heads from the rail. This system permits maximum rail accuracy for finishing cuts since relative position of the rail heads on the rail does not influence rail level.

**WATER-COOLED HEAD MOTORS** assuring ample power for high metal removal while maintaining proper operating temperatures. Bulky, clumsy, off-balance head design eliminated.

**SIMPLIFIED MACHINE CONTROL SYSTEM** immediately noticeable by the almost *complete* absence of manual controls. Customary time consuming levers,

handles and wrenches excluded.

**NEW FEED RAIL ARRANGEMENT** eliminating tangled unsightly customary hose and cable services to milling heads.

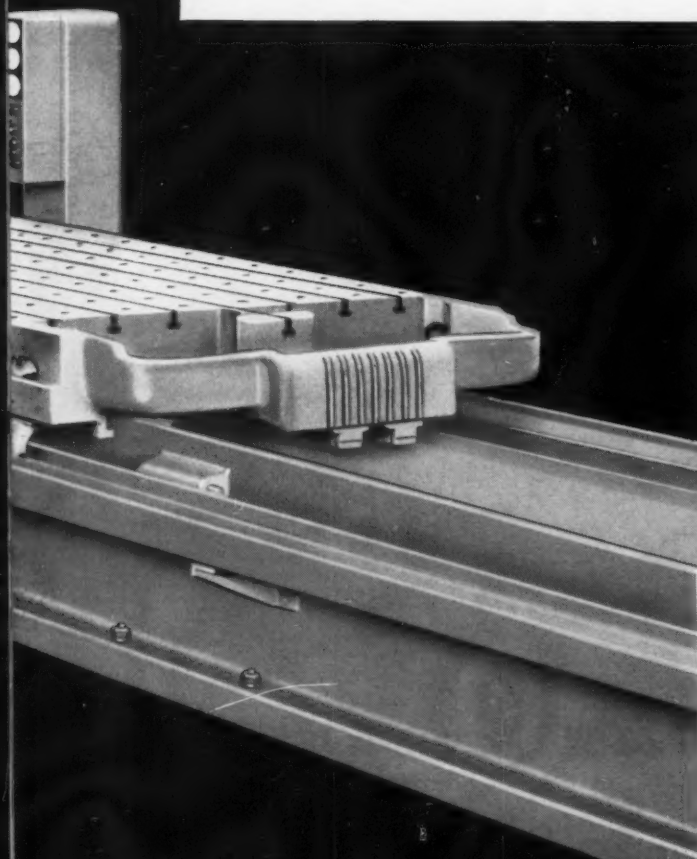
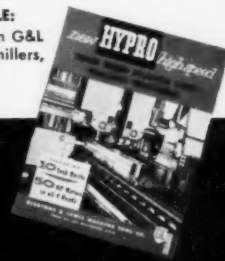
**EXTRAORDINARY HYDRAULIC CLAMPING MECHANISMS** providing maximum machine rigidity for full power, heavy-duty, rough machining operations.

These G&L HYPRO planer-type millers are offered in 14 table capacities from 36" to 144", quill size 10", water-cooled head motors 50-75-100 hp, 24 spindle speeds to 600 rpm . . . power feed to quills 1/4 to 20 ipm, head saddles 1/2 to 40 ipm, table 1 to 80 ipm.

For more information on G&L 10-inch quill HYPRO planer-millers, contact your nearest Giddings & Lewis representative, or write direct.

#### LITERATURE AVAILABLE:

For complete specifications on G&L HYPRO quill-type planer-millers, write for Bulletin No. 108.



## G & L and HYPRO DIVISION GIDDINGS & LEWIS MACHINE TOOL CO.

FOND DU LAC, WISCONSIN

G-75

Builders of the world's finest heavy-duty Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; HYPRO Double Housing and Openside Planers; Planer-Type Milling Machines; Vertical Boring Mills; Spar and Skin Milling Machines, and VARIAX Milling Machines.

*Capacities:  
#4 screws  
to  $\frac{3}{8}$ " bolts.  
Reversible and  
non-reversible  
types.*



Driving nuts to proper torque helps Bradley Laboratories, New Haven, Connecticut maintain quality standards and reduce the cost of assembling their selenium rectifiers.

After rectifier components are "stacked" on a stud, the final step in assembly requires the tightening of a retaining nut. To assure proper electrical characteristics, this nut must be tightened within close torque limits. Bradley Laboratories has found that the Magnamatic "one-shot" clutch consistently applies the exact torque output necessary to assure that every rectifier fully meets specifications . . . with Magnamatic, assemblies are never too loose . . . never too tight . . . always just right!

Operators at Bradley like the high-speed rundown and clean disengagement of the Magnamatic "one-shot" clutch because it means absence of annoying clutch buzz and ratcheting that can also overdrive fasteners. Production supervisors appreciate Magnamatic's ability to stay on the job! CP Magnamatics have been at work at Bradley for over a year without a bit of time off for maintenance.

# MAGNAMATIC.... THE KEY TO QUALITY CONTROL

*at Bradley Laboratories*



## Chicago Pneumatic

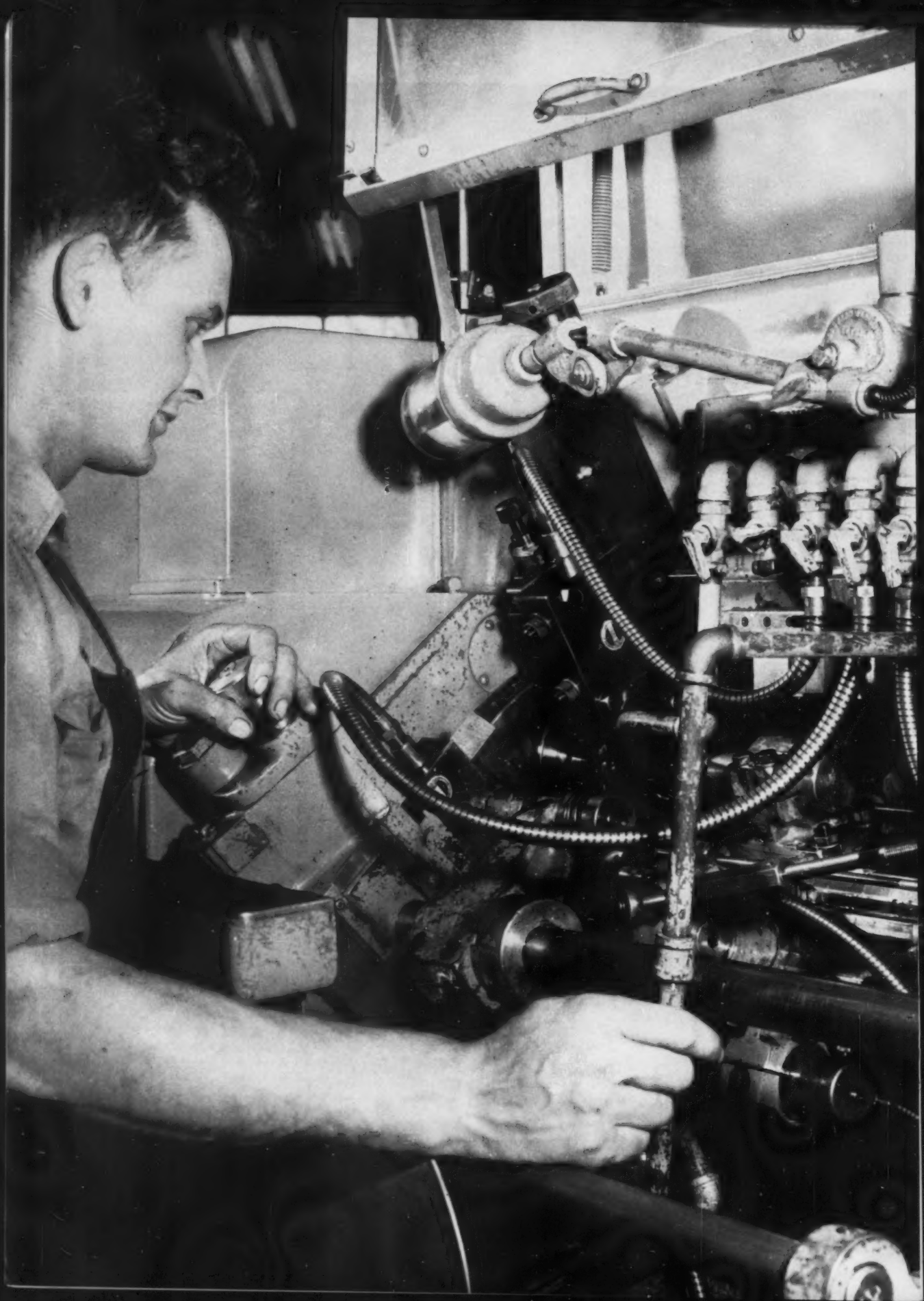
PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES  
ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

Chicago Pneumatic Tool Company Dept. M-62  
8 East 44th Street, New York 17, New York

- ☐ Please arrange demonstration. No obligation, of course!
- ☐ Please send me FREE booklet SP-3165 "Magnamatic Case Histories"
- ☐ Please send me FREE Bulletin 580 on "Magnamatic" units for multiple application.

Name   
Company   
Address   
City  Zone  State







*"Our Warner & Swasey 5-Spindle  
Automatics put us in business on  
small lot precision jobbing work..."*

REPORTS **TROY MANUFACTURING CO.** WELSHFIELD, OHIO

Success of this progressive 6-man job shop has literally been founded on the ability of their 2¼-inch 5-Spindle Warner & Swasey Automatics to produce complex work accurately, in lots as small as 500 pieces with simple tooling and fast setups.

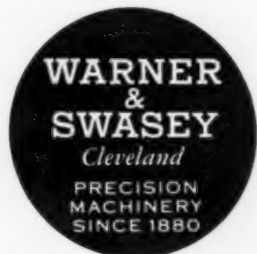
Generally accepted job shop practice precludes the use of multi-spindle operations because of the economics involved in the "set-up time—lot size" relationship. This ratio is usually quite large on conventional automatics—which eliminates them from all but the longest run jobs.

However, Troy Mfg. has found the reverse to be true in the operation of their two Warner & Swasey 5-Spindle Automatics. As Mr. Cseplo,

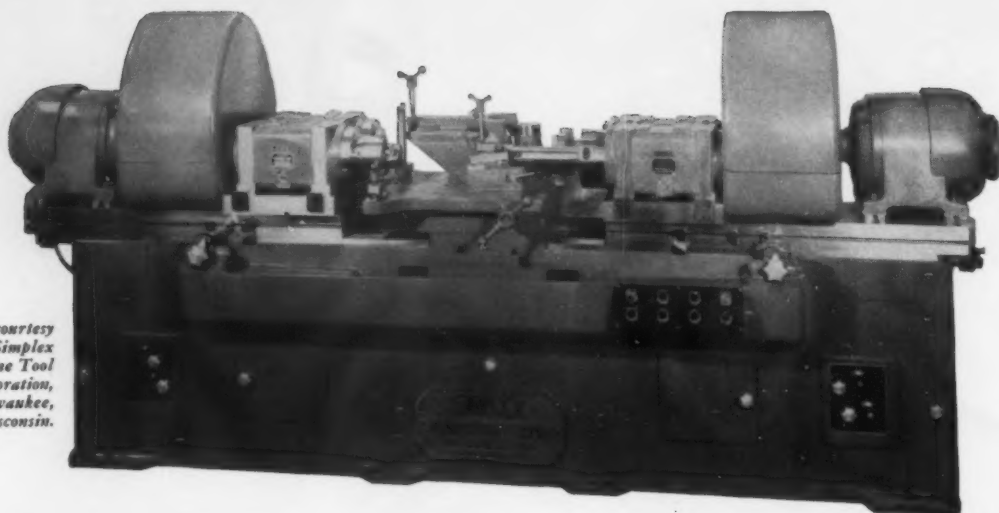
Manager of Troy Mfg., explained, "Quick set-ups permit us to profitably handle small lot work, and on jobs requiring tolerances between .001" and .002" we seldom scrap a piece which I think is good multi-spindle work. We handle an extreme range of work size and materials in short runs, and the accuracy and versatility of our Warner & Swaseys are invaluable assets to a job shop operator."

Warner & Swasey Multi-Spindle Automatics can substantially cut your machining costs on small and medium lot production—as well as on longer runs. To get the complete story of how these versatile machines can profitably fit into your production picture, call in your Warner & Swasey Field Representative, today.

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS . . . WITH A WARNER & SWASEY



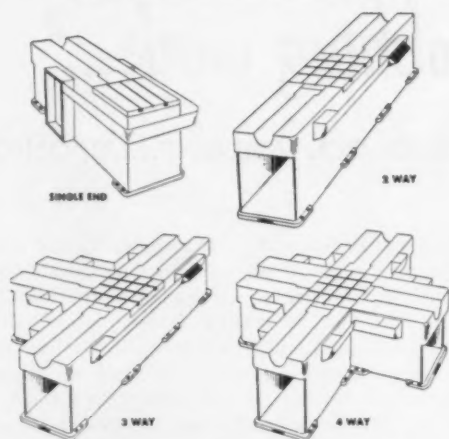
Photos courtesy  
of Simplex  
Machine Tool  
Corporation,  
Milwaukee,  
Wisconsin.



## VERSATILITY FOR MACHINE TOOLS

*Welded design does it at less cost*

### OPTIONAL BED ARRANGEMENTS



These precision boring machines can have one to four boring heads. The beds may vary in length . . . depending on the customers' needs. Such versatility in design and manufacture is made possible with welded steel . . . because:

- A welded base design can be easily and quickly modified since there are no patterns involved.
- Less material is needed since steel is three times stronger than iron,  $2\frac{1}{2}$  times as rigid . . . yet costs a third as much per pound.
- Less machining, less finishing is needed.

Basic advantages like these can be applied to many products. A Lincoln engineer who is backed by 45 years of Lincoln cost-cutting experience, will gladly show you how to benefit.

Write for Weldesign Bulletin, available to product designers.

## THE LINCOLN ELECTRIC COMPANY

Dept. 1223, Cleveland 17, Ohio

*The World's Largest Manufacturer of Arc Welding Equipment*

**W**hen steel  
is three times  
stronger than  
iron

**H**as  
much more  
versatility

**Y**et  
costs  
much less

**WHY**  
aren't your products  
designed for  
welded steel?

# Production Pointers from **GISHOLT**



TIME-  
SAVING  
IDEAS



*Presented as a service to production men, we hope some of these interesting ideas, chosen from thousands of jobs, will suggest ways to help cut time and costs in your own work.*

## NEW SIZING CONTROL AT SUPERIOR STEEL PRODUCTS CORP. CUTS COSTS

### Production setup Superfinishes die-set guide pins to $\pm .0001$ "

Here's how Superior Steel Products Corporation, Milwaukee, Wisconsin, uses Superfinish to maintain ideal clearances on die-set guide pins from 6" to 18" long and  $\frac{3}{4}$ " to  $2\frac{1}{2}$ " in diameter. For close-tolerance finishing of cylindrical surfaces, you'll want a closer look at this new automatic size control unit for Gisholt 51A and 52A General-Purpose Superfinishers.

Mounted on a standard Gisholt 51A General-Purpose Superfinisher, this new unit has a U-shaped head with two adjustable jet cartridges, set .0015" from the work, which rotates between without making contact.

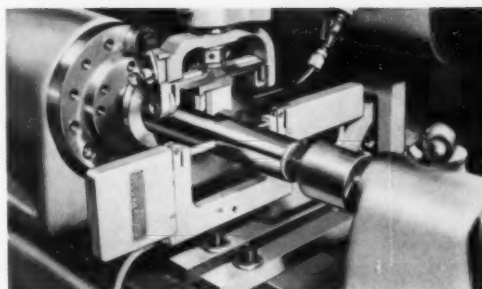
Operation is fast and simple. The operator places the work between centers and starts the Superfinishing cycle. As the Superfinishing stone quill descends, the size control head is raised under the part to operating position. Ordinarily, the Superfinisher has a rough and finish cycle preset by electric timers. The size control head replaces the roughing timer so that the length of the roughing cycle is automatically determined by the amount of stock to be removed.

When the desired dimension is reached, the size control initiates an electrical connection, increasing the spindle speed and starting the finishing cycle which is controlled by the standard timer. Enough stock is removed during the roughing cycle to bring the part within the required tolerance; and the standard finishing cycle is still used to give the desired low micro-inch surface finish. As the Superfinishing cycle ends, the stone quill retracts and the size control head descends, thus clearing the part for unloading.

In the setup shown, Superior Steel is Superfinishing a guide pin 8" long and  $1\frac{1}{2}$ " in diameter in 50 seconds f.t.f. time. The hardened parts come to the machine from .0002" to .0012" above the mean dimension, and are Superfinished to a controlled surface finish of 2 to 3 micro-inches and sized within .0002" of each other.

300 to 350 pins are Superfinished before the stone must be replaced.

*Superfinish reduces possibility of scoring, offers smoother operation. Many hours can be saved by Superfinishing parts within .0002" of each other on a production basis using low-cost, general-purpose Superfinishers equipped with size control units.*

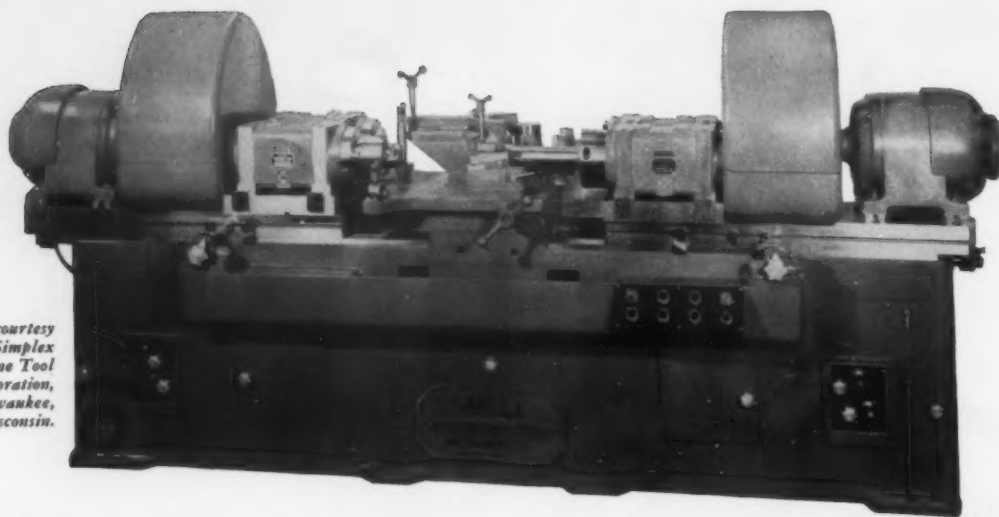


51A Superfinisher, with size control unit to Superfinish hardened die-set guide pins within 2 to 3 micro-inches RMS, and holding size within  $\pm .0001$ " of each other. Several part sizes handled are shown in foreground.

Size control head on 51A Superfinisher, set up for 8"-long,  $1\frac{1}{2}$ "-diameter guide pin. Variety of parts is handled, with tooling changed several times daily. Change-over time is 5 min. or less.



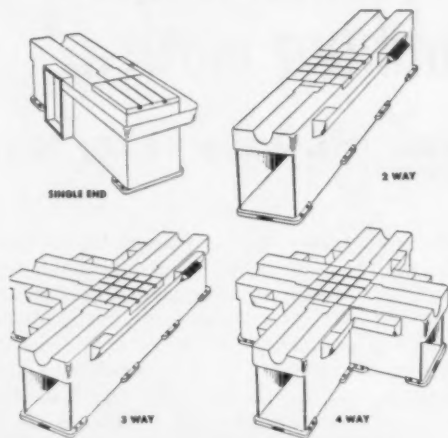
Photos courtesy  
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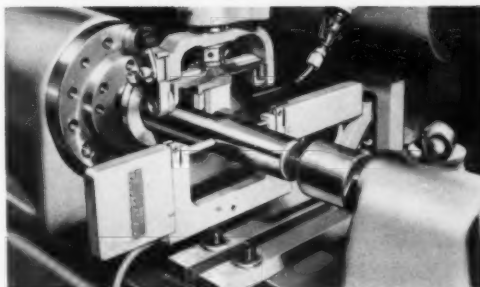
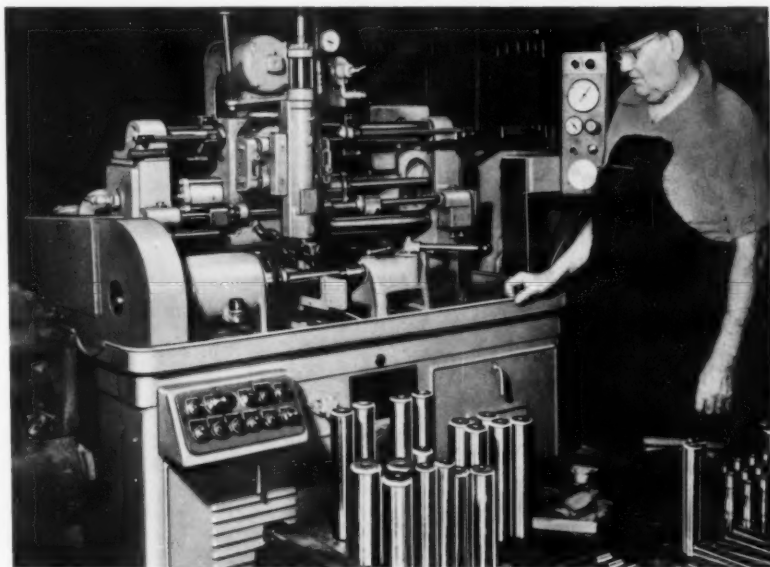
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## CUT UNIT COSTS WITH

### HOW PRATT & WHITNEY USES JETracer ON TRICKY JET ENGINE PART

TIME-  
SAVING  
IDEAS

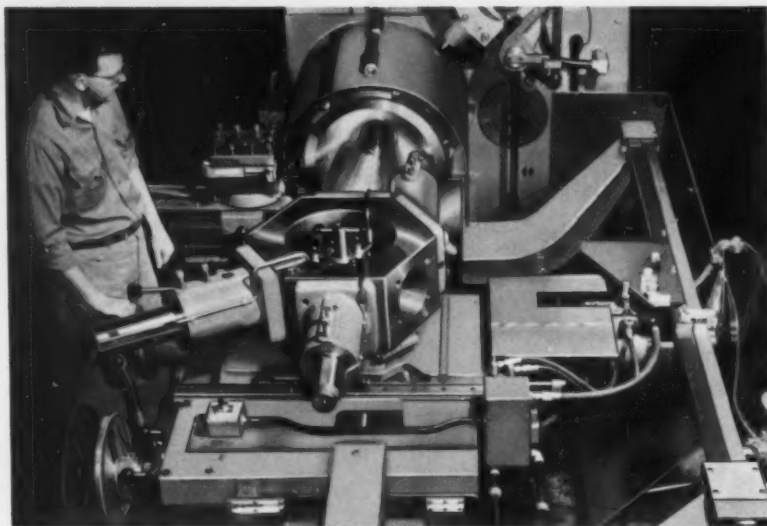
**Machines bell-shaped end of special-alloy part with speed and precision**

If you're producing parts requiring contour boring or turning operations, perhaps you can use this arrangement to reduce tooling costs and cut your set-up time.

Here's how Pratt & Whitney Aircraft's North Haven, Connecticut, plant is machining the bell end of a special-alloy rear compressor rotor for jet engines. A Gisholt MASTERLINE 4L Saddle Type Turret Lathe is used, equipped with a cross-feeding turret JETracer control with 8" of transverse travel. A bonnet-type fixture holds the long workpiece, providing ample rigidity. Setscrews grip on the large O.D., centralizing the work and dampening vibrations to provide a smoother finish.

The JETracer governs transverse movement of the cross-feeding turret as the stylus follows a flat template, which is mounted at the rear of the turret carriage.

Standard front square turret and hexagon turret tools finish a 19% "



JETracer control for cross-feeding hexagon turret is at rear, away from chips. Template has dial indicator and locating blocks for transverse and longitudinal adjustment.

flange and rough-out a part of the small bore at the base of the cone. The 12°-deep cone angle is generated—and the small base bore contoured by a tool in a special offset flanged holder on the JETracer-controlled, cross-feeding hexagon turret. Concentricity between flange O.D. and the cone base diameter is held within

.001". Floor-to-floor time on this difficult part is held to only 45 minutes.

*JETracer-controlled, cross-feeding hexagon turret gives added flexibility for fast, accurate internal boring operations. Handles long or short workpieces anywhere along length of bed. Depth limited only by length of boring bar and runout tolerance of part.*

### SETUP ELIMINATES OPERATION IN MACHINING 27" FLYWHEELS

**Simplimatic setup completes maximum number of surfaces in single chucking, assuring parallelism and concentricity**

This setup may be just what you want to cut unit costs. By taking advantage of the Simplimatic's versatility, this manufacturer is machining 27"-diam-eter cast iron flywheels in just 7.5 minutes f.t.f.

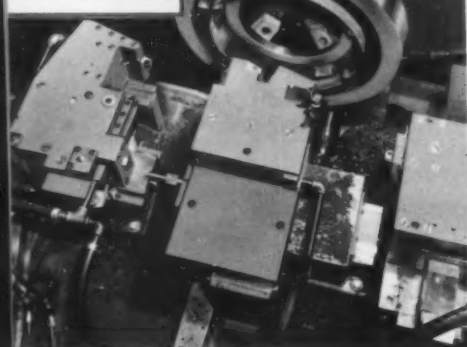
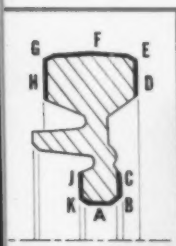
Here's how it's done: The operator positions the part with an overhead crane. Located on the web against jacks on the 24", three-jaw scroll chuck face, the flywheels are gripped through three cast openings using a power chuck wrench. The Simplimatic's platen table traverses tools to the work, changes to feed, and finishes bore A with three tools on the center

slide. Spindle speed is 90 r.p.m.

When the bore is finished, a two-speed motor reduces spindle speed to 45 r.p.m. All slides operate simultaneously. Four tools on the front slide straddle-face D-H and chamfer E-G. The front facing tool block pivots for tool relief. Tools on a cam-controlled auxiliary slide on the rear slide contour-turn F, leaving the center .023" high with a  $\frac{3}{8}$ " radius at the high point. The turning tool is relieved at the end of the cut. Center slide tools feed transversely, straddle-facing C-J and chamfering B-K to complete the part.

*Simplimatic's flat platen table permits positioning independent slides for maximum tool support and effectiveness. Two-speed motor provides desired finish; table feed saves additional handling or special tooling for boring operation.*

◀ Overhead view showing workpiece, method of chucking, surfaces machined and tooling. Note pivoting tool relief on front slide at left end, and cam-operated auxiliary slide in tool block at far right.



LOOK AHEAD... KEEP AHEAD... WITH GISHOLT



# THE GISHOLT MASTERLINE



## NATIONAL CASH REGISTER CUTS TIME MACHINING UNUSUAL PART

**Combines well-planned tooling with JETracer on Gisholt Ram Type Turret Lathe to reduce floor-to-floor-time**

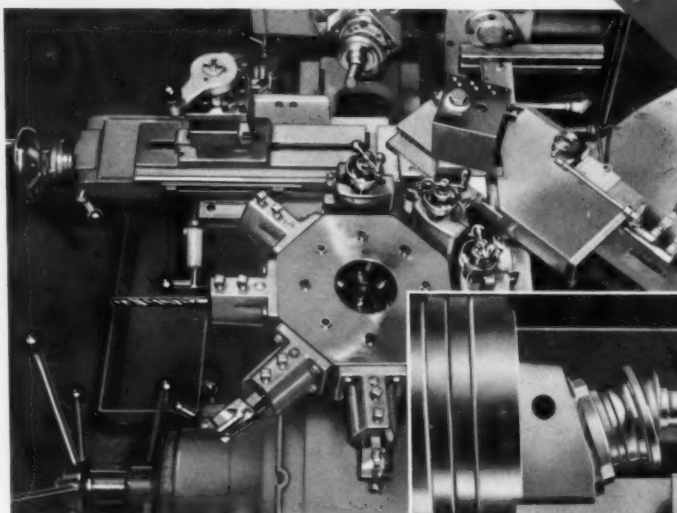
This setup shows how National Cash Register Company, Dayton, Ohio, is machining a steel motor wobbler drive shaft forging—using the versatile Gisholt JETracer on the MASTERLINE No. 5 Ram Type Turret Lathe.

The part actually has two center lines. It is held parallel to the spindle center line during the first three operations, then held on an offset fixture to machine several eccentric diameters to high accuracy in the final operation.

The large flange is machined in the first operation. All internal diameters—plus five diameters in section A—are handled in the second operation.

For the third operation, the work is chucked on the large end, locating against the back of the large flange. The long shaft and the concentric diameters in section B are finished, using the JETracer and tools on the octagon and front square turrets.

To finish the eccentric diameters, a special expanding mandrel on an offset face plate fixture supports and locates the work in the previously machined I.D. Front tool post tools rough, and the JETracer on the rear of the cross slide finish contour-turns this section. Floor-to-floor-time is thus held to an impressive 2.85 minutes.

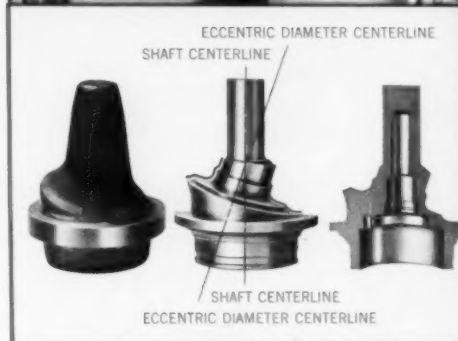
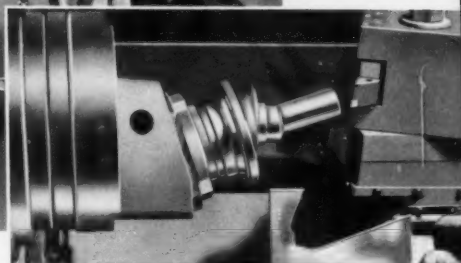


▲ Finished part shown on offset face plate fixture. Note octagon turret. JETracer on rear of cross slide does not hinder use of standard tools.

(Inset) Workpiece on special offset fixture with template in foreground.

L. to R.: Workpiece after first operation, showing amount of stock to be removed; finished part, with both center lines indicated and eccentric surfaces outlined; sectioned workpiece showing internal surfaces.

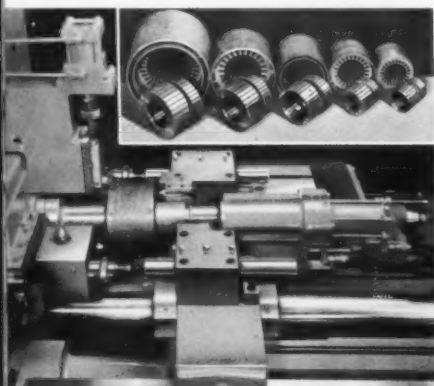
*JETracer saves time, assures accuracy, eliminates human error. Only one tool on octagon turret is replaced during the four operations. Square turret tools are changed as needed.*



## VALLEY ELECTRIC LOWERS COSTS IN MOTOR FRAME MANUFACTURING

**Handles both ends in single chucking on No. 12 Automatic using special auxiliary slides**

Bushings and spacers for expanding mandrels speed change-over. Spacers added when bore diameter remains the same, bushings added when bore diameter changes.



You may see the way to more parts per hour by studying this setup at Valley Electric Corp., St. Louis, Missouri. Here, the No. 12 Automatic Production Lathe is handling 18 sizes of electric motor frames—both cast iron and steel—boring or turning rabbet fits on three different types of work pieces.

Let's look at the machining cycle on a typical frame. Slipped on an air-operated expanding mandrel, located against an air-operated automatic retracting locator on the headstock, the work is chucked in the I.D. and supported on the right end by an arbor.

Headstock-mounted front and rear auxiliary slides are operated by forward movement of standard front carriage and rear independent slide.

The locator retracts to clear the part and the cycle begins.

To machine the motor frame simultaneously at both ends, special headstock-mounted auxiliary slides are used, operated by forward movement of the front carriage and rear independent slide. Facing, rough-turning and chamfering are handled from the rear independent and rear auxiliary slides, while the front carriage and front auxiliary slides finish bore and chamfer. F.t.f. times range from less than one minute on the smallest part to three minutes on the largest part handled.

*Inner rabbet fits are machined on parts from 7½" to 10⅞" O.D. and 2½" to 6" wide, and outer rabbet fits are machined on parts from 6½" to 12¾" O.D., and from 4¾" to 10" wide.*

TALK TO GISHOLT ABOUT MACHINE TOOL LEASING





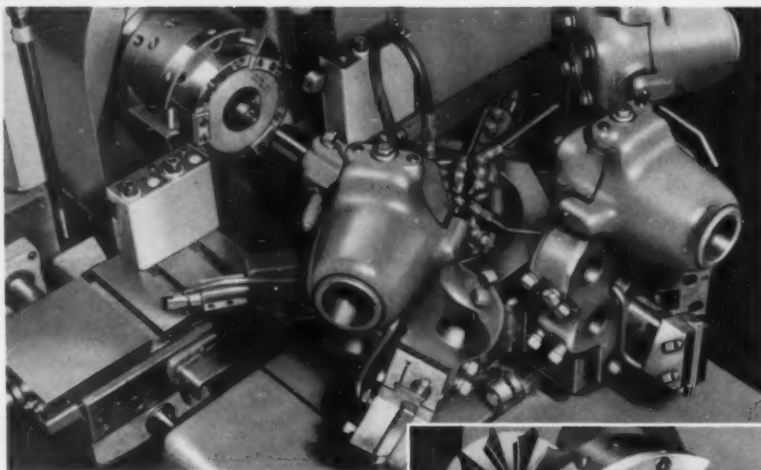


**TIME-  
SAVING  
IDEAS**

**Uses the 1F  
Fastermatic  
with special chucking  
fixture to simplify  
turbine wheel machining.**

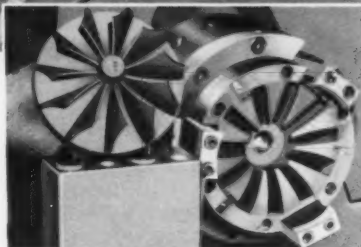
This turbine wheel casting, used in Cummins Turbojet Diesels, is made from Haynes Stellite No. 31—an exceptionally hard material offering high resistance to heat and oxidation. To get the accuracy required and handle a heavy forming cut on the hub radius, the part has to be driven from the back side with very rigid support. The vanes make standard chucking methods impractical. Here is how Cummins Engine Co., Inc., Columbus, Indiana, machines this part accurately in only 12 minutes f.t.f., 25% less than the 16 minutes required previously.

A special air-operated fixture holds the work in a molded plastic driving nest, formed to fit the contour of the turbine wheel and vanes. The 5 1/2"-diameter, 2 3/8"-deep part is accurately located and centralized in this driving nest, and clamped on the outer face with three drawback fingers. Hexagon turret tools drill, bore, face,



form and turn the piece, leaving stock for grinding. Front and rear cross slide tools rough and finish-face the hub. A two-speed motor provides the correct low speed on the forming cut for finer finish and longer tool life.

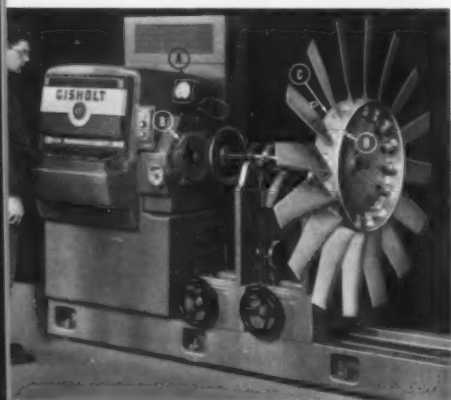
*Special plastic driving nest gives positive location, centralizes part, provides maximum rigidity. Tough material is machined in less time through Fastermatic's smooth hydraulic feed, with tools reground only once for each eight-hour shift.*



Finished workpiece in fixture. Piloted turning heads give maximum tool support. (Inset) Accurate location and rigid support provided by plastic driving nest which holds turbine wheel (in hand).

## HOW JOY MFG. BALANCES FANS MORE ACCURATELY, FASTER, CHEAPER

**Handles large fan rotor assemblies in overhang position on 2U Balancer, obtaining two-plane balancing**



Workpiece rotated on balancing arbor outside the work supports. Correction made at C and D. (Shrouding, which reduces air turbulence, removed for photo.)

You'll get ideas from this balancing job—it shows how Joy Manufacturing Co., New Philadelphia, Ohio, has improved accuracy and reduced balancing costs. They are using a new Gisholt 2U Balancer to handle large axial flow fan rotor assemblies up to 66" diameter and weighing 40 to 105 pounds.

Since the large-diameter workpieces do not have their own shafts, a mounting arbor is placed between the work supports with a full bearing and a counterweight on the left support, to keep the center of gravity between the supports and prevent "lift" during work rotation. The parts are simply slipped on the arbor end and balanced in the overhang.

Operation is simple: The part is loaded and rotated at balancing

speed. The amount of unbalance in each correction plane is read on the direct reading amount meter (A), which indicates unbalance in terms of the correction method being used. Although the correction planes are only 1 3/4" apart, unbalance cross effects are eliminated by the balancer's electrical networks and do not affect machine accuracy. Angle of unbalance is clearly indicated on dial (B). Correction is by adding weight at both edges of the turbine blade mounting rim at the indicated angles.

*Close balancing tolerances are easily held. The new Type U Balancer provides ample swing (68") for largest parts with no decrease in accuracy whether balancing operations are performed with the work between or outside of the standard work supports.*

No. 9-1057  
688



**THE GISHOLT ROUND TABLE** represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

# GISHOLT

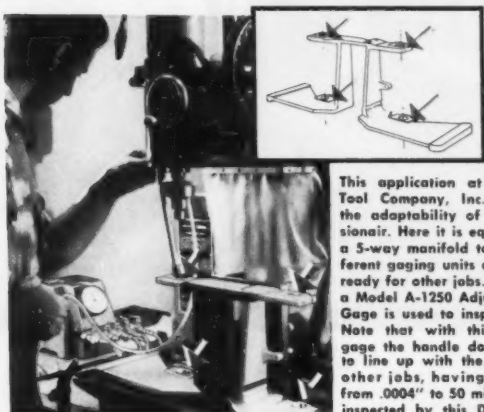
MACHINE COMPANY

Madison 10, Wisconsin

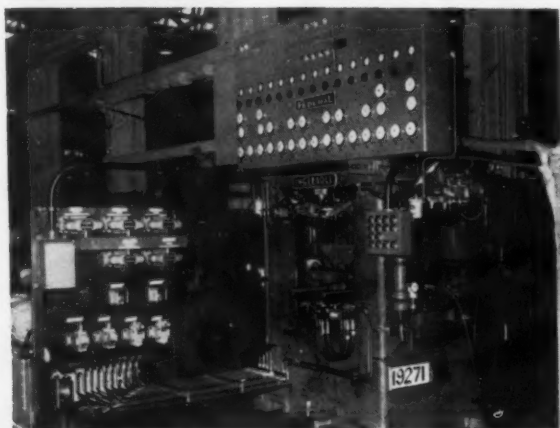
**TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES**

# THEY GAGE THESE JOBS BETTER with the ***DIMENSIONAIR***

The increased complexity of more and more of today's gaging requirements calls for the utmost in dependable accuracy. So many times the accuracy of one dimension is dependent upon the accuracy of another. Automation, too, brings in another set of complications where misbehavior of the gaging process can upset your whole schedule

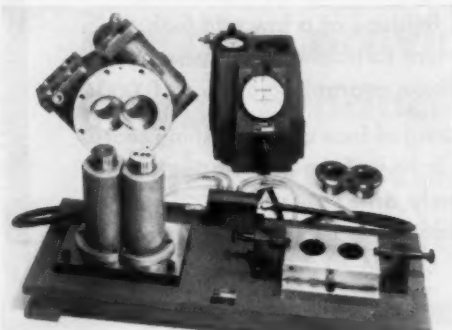


This application at the Arrow Tool Company, Inc., illustrates the adaptability of the Dimensionair. Here it is equipped with a 5-way manifold to which different gaging units are attached ready for other jobs. On this job a Model A-1250 Adjustable Bore Gage is used to inspect 4 holes. Note that with this particular gage the handle does not have to line up with the hole. Many other jobs, having tolerances from .0004" to 50 millionths, are inspected by this Dimensionair.

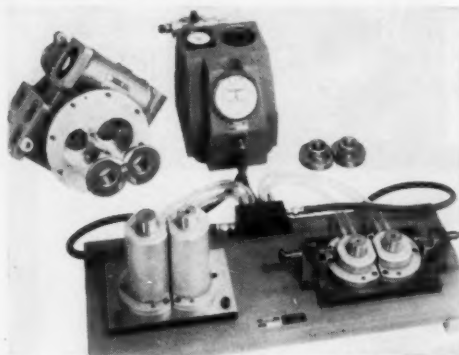


Federal air-electric gaging and classifying equipment was used in this gaging station on an engine block transfer line. Two diameters in each of five crankshaft bores and two each in five camshaft bores are measured — twenty holes in all. After automatic assembly, oil holes in the five bearing liners are checked for alignment with the holes in the camshaft bores. All conditions are checked simultaneously. Signal lights indicate all dimensional conditions. Unsatisfactory blocks are automatically rejected. Cycle time is well within production cycle time. Ingersoll Milling Machine Company supplied the handling and positioning units.

The dependable no-drift accuracy of the Dimensionair is of the utmost advantage in such cases. Its reliability keeps quality up and keeps production rolling. Even on the simpler jobs the dependable no-drift accuracy and the foolproof operation of the Dimensionair are definitely appreciated. Call on us if you want to do a better gaging job. See our address below.



Two differential type Dimensionairs are used on this precision assembly. The first step is shown above. Parallel bores in a gear housing are located on the twin gaging plugs and the bushings that are to be pressed into these bores are placed in the twin ring gage at the right. The Dimensionair shows whether the flange flats on the bushings will have the proper clearance when bushings are assembled in the housing.



A second gage is used for the next step. After the bushings are inserted in the housing, they are located on the left hand pair of gage plugs. Then, a different set of bushings for the cover plate is placed on the right hand plugs. The single dial on this gage shows whether the center distances in the two pairs of bushings are the same within a tolerance of  $\pm .0005$ ". If the first two cover plate bushings measured do not meet this standard, others can be tried until a pair is found that does. Proper alignment of these bearing surfaces is assured at final assembly.

**FEDERAL PRODUCTS CORPORATION**  
71110 Eddy Street, Providence 1, R. I.

Ask **FEDERAL** First

FOR RECOMMENDATIONS IN MODERN GAGES . . .

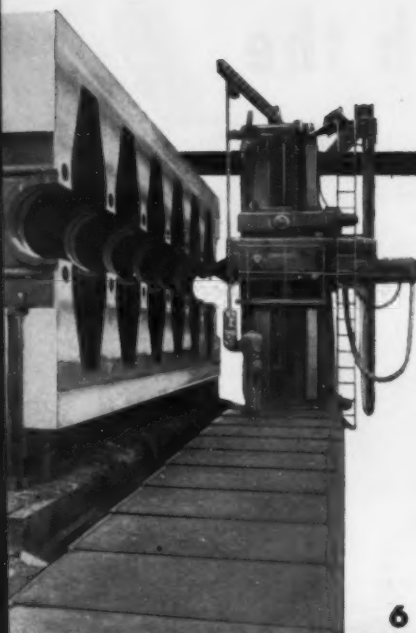
Dial Indicating, Air, Electric, or Electronic — for Inspecting, Measuring, Sorting, or Automation Gaging

For more information fill in page number on Inquiry Card, on page 237

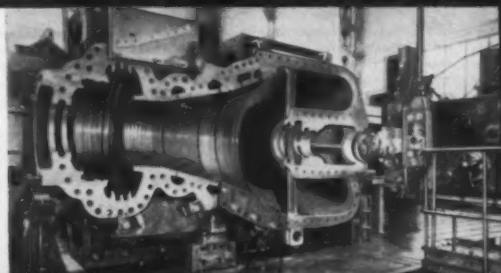
MACHINERY, October, 1957—33

cut your setting-up and  
machining costs by using  
**INNOCENTI** CWB horizontal  
milling and boring machine

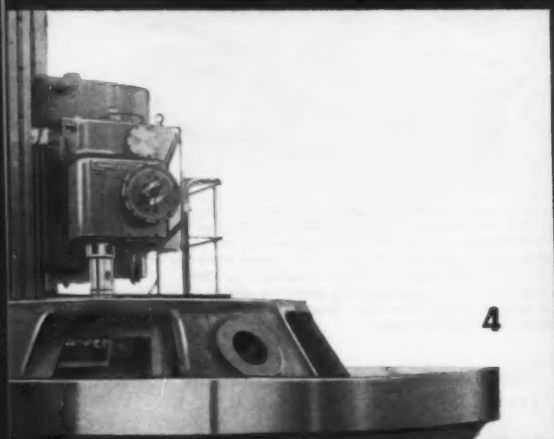
- 4 boring of bushing in a francis turbine after turning operation  
**in only one set-up**
- 5 boring, grooving, cutting, drilling  
and finishing of a low and high  
pressure turbine **in only one set-up**  
precision guaranteed up to  $\pm 0.0004$
- 6 finishing of face and of bushing seats  
and boring of the bushing seats  
**in only one set-up**  
guaranteed precision up  
to  $\pm 0.0004$



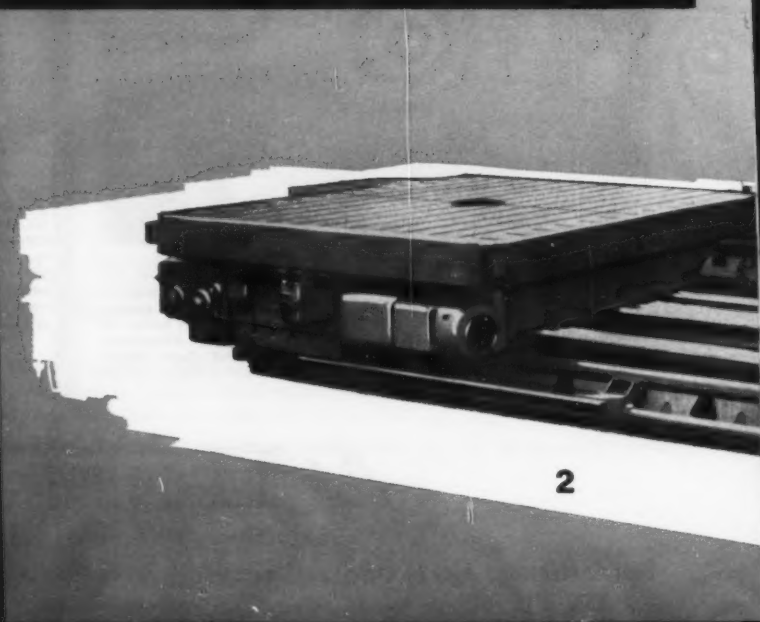
6



5



4



2

works in milan (italy)



**INNOCENTI CWB**  
**milling and boring**  
**machine provides**  
**high production**  
**highest precision**  
**versatility**

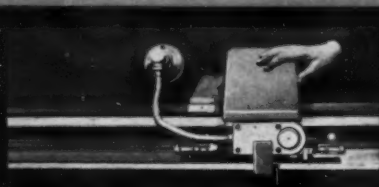
milling and boring machine FAF 305/200 1

high precision indexing table suitable  
also for milling and turning operations 2

device insuring automatic cycles and  
precision stops with accuracy up to 0.0004 3



1

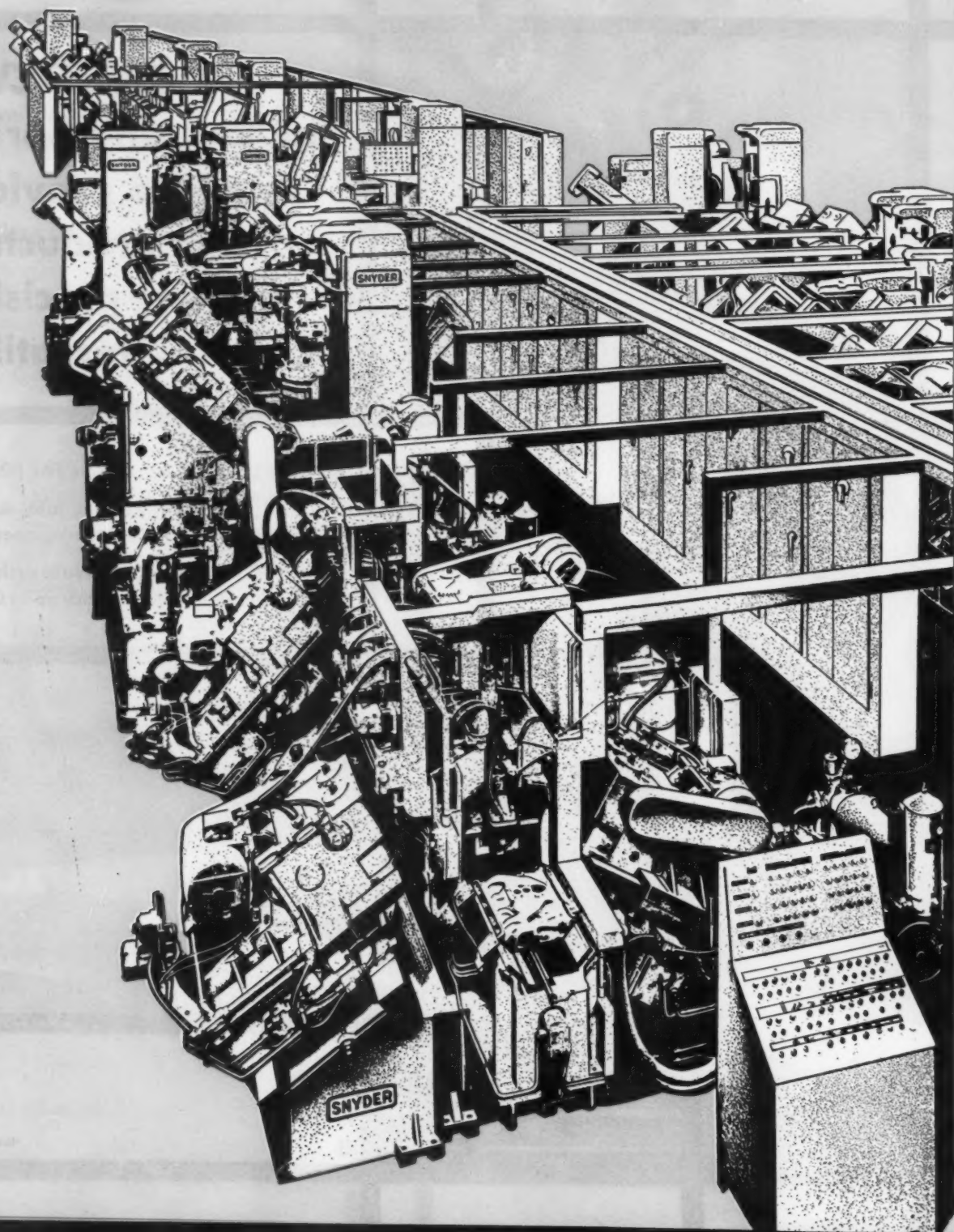


3

bertani F4



# Unique Combination of Snyder Special Two or Four Barrel Intake Manifold

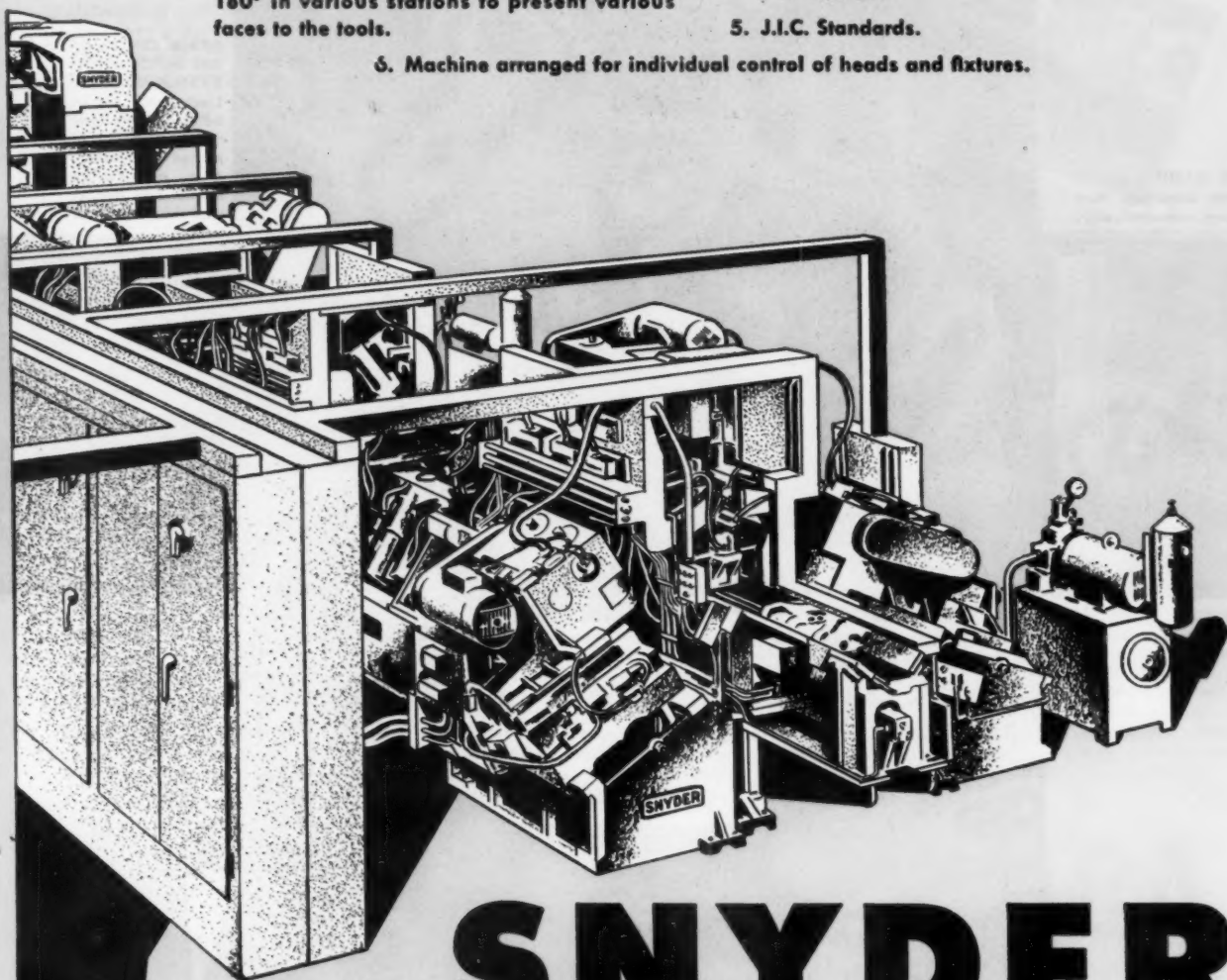


# Transfer Machines Processes Either Castings from Rough to Finished Parts

Combination of two special transfer milling machines in parallel, with automation, feeding into one special transfer drilling machine gives production of 136 pieces per hour

## Special Features of Snyder Machines Nos. 55-60 and 55-61

1. Machine line handles two or four barrel manifolds, random intermixed; sensing devices automatically instruct the proper drilling and tapping units.
2. Part rotated vertically 180° and horizontally 180° in various stations to present various faces to the tools.
3. Individual electrical panels and hydraulic units for each segment.
4. Wing bases, sections, spacers and risers stand-ard throughout for easy adaptation to future part changes.
5. J.I.C. Standards.
5. Machine arranged for individual control of heads and fixtures.



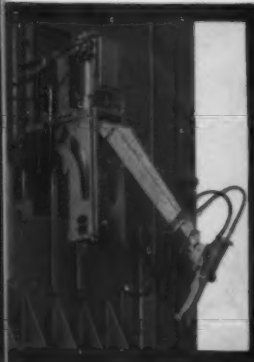
# SNYDER

TOOL & ENGINEERING COMPANY  
3400 E. LAFAYETTE • DETROIT 7, MICHIGAN

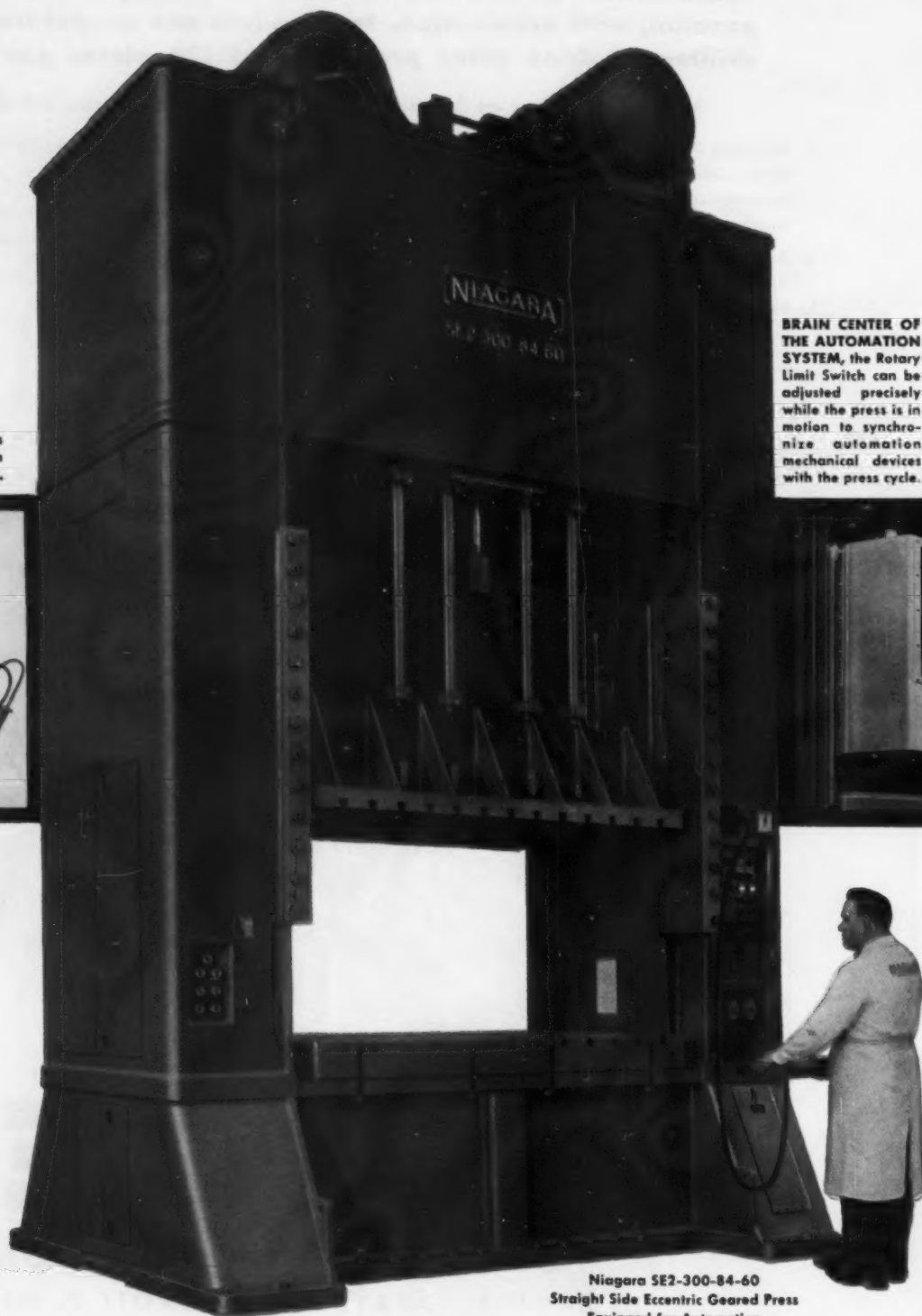
*32 Years of Special Machine Tools with Automation*

# see how mighty Niagara Presses

**IRON HAND** removes finished stampings from the press, automatically.



**BRAIN CENTER OF THE AUTOMATION SYSTEM**, the Rotary Limit Switch can be adjusted precisely while the press is in motion to synchronize automation mechanical devices with the press cycle.



Niagara SE2-300-84-60  
Straight Side Eccentric Geared Press  
Equipped for Automation



# are automated for peak productivity

**Engineered to excel in large, heavy tonnage drawing, punching and blanking work, Niagara Straight Side Eccentric Geared Presses are readily outfitted with the most advanced automation controls and devices. Net result: Streamlined production, greater safety and simplified operation.**

Take a look at the modern, enclosed construction of this rugged Niagara Two-Point Eccentric Geared Press. See how today's most advanced automation controls and devices are furnished as integral, built-in components of the press itself . . . with piping and wiring fully concealed. Note, too, how the driving assembly is neatly housed within the crown. Nothing has been overlooked in making this press an outstanding engineering triumph.

Niagara's eccentric drive delivers greater torque with less deflection. Rigid, all-steel, four-piece, tie rod frame provides utmost accuracy and prolonged

die life. Niagara's low inertia, pneumatic friction clutch runs cooler and outlives others, for most of its weight continues to rotate with the flywheel to reduce heat and wear.

**MAKE SURE THAT YOU HAVE ALL OF THE FACTS** on Niagara Straight Side Eccentric Geared Presses . . . the one point, two point and four point designs in capacities from 100 - 1000 tons . . . and how they can be equipped for automation. Write for illustrated Bulletin 66 today.



**NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N.Y.**

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**AIR CONTROL PANEL** (Above left) conceals and protects air line pressure switches, lubricators, filters, gauges and valves behind dust-tight doors within one of the uprights.

**CONTROLLED AIR SUPPLY RECEPTACLES** (Above right) are provided for die doper, die kicker and die lifter, all synchronized with press cycle. Auxiliary receptacles are for die maintenance tools.

**AUTOMATIC CIRCULATING OIL SYSTEM** (Above left) sends metered flow of clean, filtered oil to all bearings and gears in the crown, as well as to slide gibs. Correct operating oil pressure is maintained, or press stops automatically.

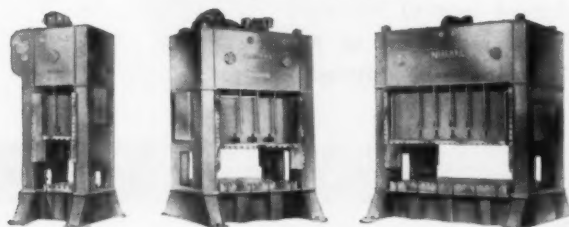
**OPERATOR'S PANEL** (Above right) features deluxe operating controls conveniently arranged for fingertip direction of every press motion. Note receptacle for "RUN" push button station and Selsyn stroke position indicator.

**AUX. POWER SUPPLY & SAFETY BLOCK.** (Above left) Two 110 V. and two 440 V. receptacles for automation equipment, conveyors, tools, etc. Safety block (stored in bin) is chained to safety plug which de-energizes press control when pulled from receptacle.

**COMB. MOTOR & PRESS CONTROL** (Above right) in oil and dust-tight enclosure flush mounted in frame.

## ONE-POINT, TWO-POINT AND FOUR-POINT SUSPENSION

(100 through 1000 ton capacities)



# NIAGARA

straight side  
**ECCENTRIC GEARED presses**

America's most complete line of presses, press brakes, shears, other machines and tools for plate and sheet metal work.



*Announcing a new addition to  
"American" Pacemaker Lathes . . .*

**ultra**



These fine ultra precision tools are produced with such meticulous care and precision that we use the protection of re-enforced boxing for each lathe regardless of the distance to be shipped.

# The "AMERICAN" precision PACEMAKER LATHE

*... for both Conventional  
and Contour Turning*

Backed by the prestige of the world famous "American" Pacemaker Lathe these new Ultra Precision Lathes, built to tolerances heretofore considered fantastic, are now offered to meet the newest and the most exacting requirements of accuracy and finish. Long awaited and long needed, ultra precision is at last a reality in both straight and contour turning.

If ultra precision and finish are your requirements, let this newest type lathe solve these problems for you.

**INQUIRE . . .** Send us your work prints with required tolerances shown. Before quoting, we shall first prove out your ultra precision problem.

A precision finished sample work piece will accompany each new lathe to your factory.



**THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.**

*Lathes and Radial Drills*

# Spindle grinding job demonstrates how Norton Swivalign\* Indicator beats "cut-and-try" method



**THE JOB** Finish grinding bearings and tapers on grinding wheel spindles.

**THE PROBLEM** Reduce grinding time and costs.

**THE SOLUTION:** The use of Norton's SWIVALIGN dual-electric indicator to measure swivel table adjustment in setting up the grinder.

Here is another Norton forward step in the teamwork between man and machine.

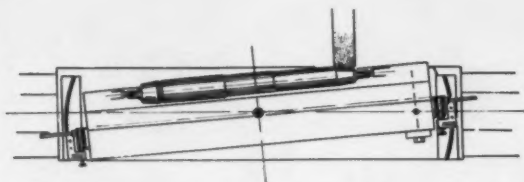
The man sets the indicator . . . the SWIVALIGN device permits him to put the work in line more accurately than the human eye could see.

There were two savings here: First, the tedious time consuming work of the cut-and-try method was eliminated entirely; second, the grinding time for this job was reduced a full 15%. It's just another demonstration of the *every-time* cut in hours and work by use of

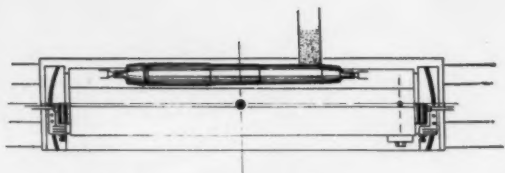
the Norton SWIVALIGN Indicator.

**FOR INFORMATION** on the Norton SWIVALIGN Indicator and on its application to Norton universal and cylindrical grinders, see your Norton Representative, or write direct. And remember, only Norton offers you such long experience in both grinding machines and wheels to bring you the "Touch of Gold" that helps you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Mass. *In Canada:* J. H. Ryder Machinery Company, Ltd., Toronto 5.

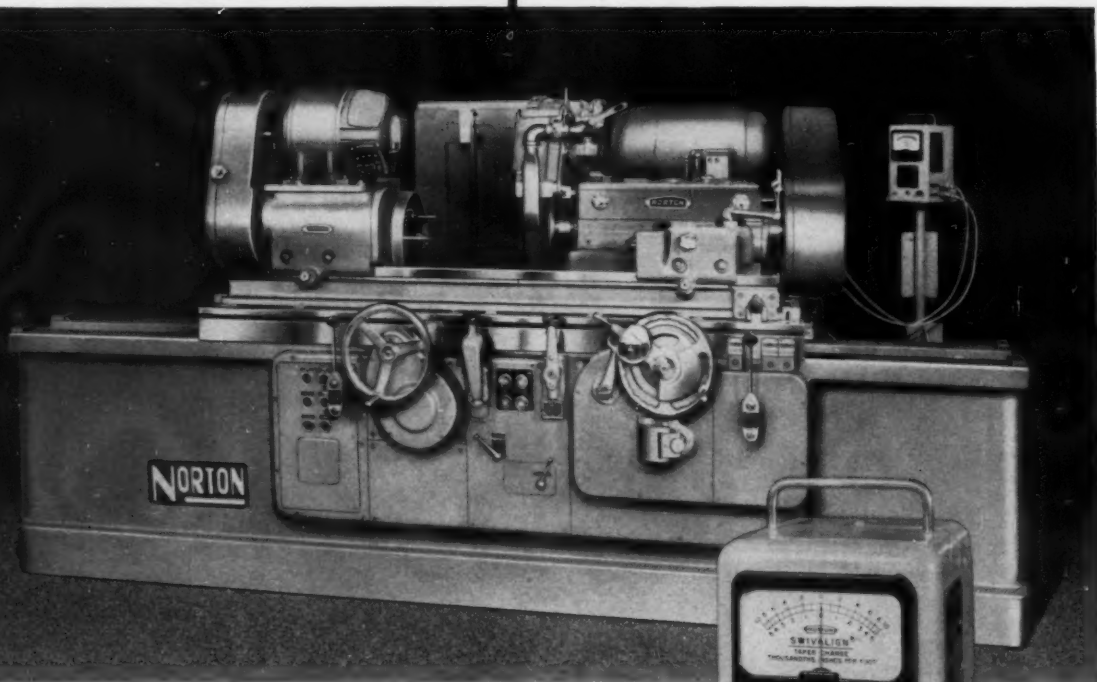
\*Trade-Mark



**GRINDING SPINDLE TAPER ENDS** went more quickly and cost less when a Norton SWIVALIGN device was used to set the table at the correct angle to grind.

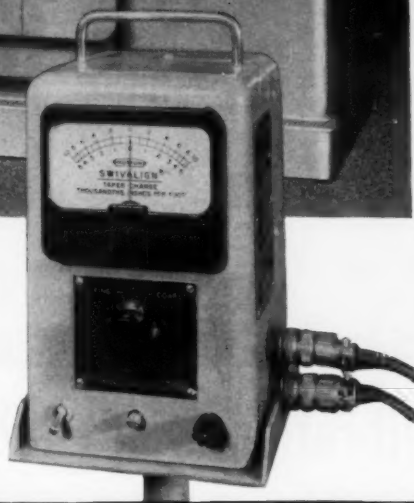


**BEARING DIAMETERS** of the spindle quickly moved into correct position for grinding . . . SWIVALIGN unit proved vastly superior to old "cut-and-try" method.



▲ **SWIVALIGN DUAL ELECTRIC INDICATOR** on TYPE CTU cylindrical grinder was used to demonstrate savings on spindle finish grinding. The SWIVALIGN Indicator is also available on Norton universal grinders.

A NORTON "TOUCH OF GOLD" development for faster, better, lower-cost grinding is the SWIVALIGN Indicator. It enables the operator to adjust the angular positions of swivel tables quickly and accurately. Positive response and easy operation are features.



To Economize, Modernize with NEW



**GRINDERS and LAPPERS**

*Making better products...  
to make your products better*

District Offices: Worcester • Hartford  
Cleveland • Chicago • Detroit

NORTON PRODUCTS: Abrasives • Grinding  
Wheels • Grinding Machines • Refractories

BEHR-MANNING PRODUCTS: Coated Abrasives  
Sharpening Stones • Behr-cat Tapes





## Vibration won't loosen FLEXLOC self-locking nuts

Where products must be reliable... must stand up under vibration, temperature extremes and hard use... designers specify rugged, reliable, precision-built FLEXLOC self-locking nuts.

### HERE'S WHY:

FLEXLOC locknuts are strong: tensile strengths far exceed accepted standards. They are uniform: carefully manufactured to assure accurate, lasting locking action. And they are reusable: repeated removal and

replacement, frequent adjustments, even rough screw threads will not affect their locking life.

Standard FLEXLOC self-locking locknuts are available in a wide range of standard sizes, types and materials to meet the most critical locknut requirements. Your local industrial distributor stocks them. Write us for complete catalog and technical data. Flexloc Locknut Division, STANDARD PRESSED STEEL CO., Jenkintown 19, Pa.

We also manufacture precision titanium fasteners. Write for free booklet.

STANDARD PRESSED STEEL CO.

**FLEXLOC** LOCKNUT DIVISION

**SPS**  
JENKINTOWN PENNSYLVANIA



# Jacobs

## CHUCKS

Accuracy in performance is achieved by accuracy in production of every component part.

Jacobs and your industrial supply distributor are ready to deliver the chucks you need and the service you deserve. First in chucks ... first in service.

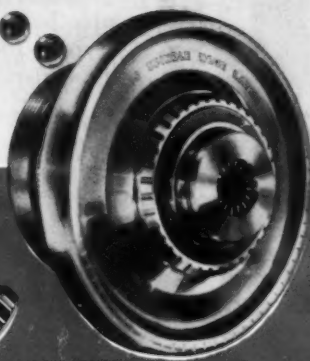
**The Jacobs Manufacturing Company**  
West Hartford, Connecticut



The Jacobs Ball Bearing Super Chuck for heavy duty and precision industrial use.



The Jacobs Rubber-Flex® Tap Chuck designed for tapping heads and impact tools.



The Jacobs Model 91 Spindle Nose Collet Chuck for tool room and engine lathes.



The Jacobs Impact Keyless Chuck especially designed for the aircraft industry.



The Jacobs Model 96 Collet Chuck for grinding machines, millers and jig-borers.



The Jacobs Plain Bearing Chuck for drill presses, portable electric and air tools.

# here's how Seeburg matches P-K® fasteners to the job

**And Parker-Kalon's wide range of types and sizes makes it possible**

"By carefully selecting the right P-K screw for each assembly we've reduced rejects and stepped-up production," says Joseph Kamys, engineer of J. P. Seeburg, manufacturers of the famous line of Select-O-Matic "200" Coin Operated Phonographs.



◀ "Take the fastening of metal kickplates and base moldings to wood cabinets, for example. They must hold permanently and go in fast without splitting the wood. P-K Type-A Self-tapping Screws are just right for the job."



"In a metal-to-plastic application such ▶ as the fastening of high-frequency speakers to formed plastic housings—P-K Type-Z thread-forming Screws go in right without cracking the plastic—stay put, even under high vibration."



◀ "In this important subassembly, appearance is important as well as dependable holding power. Here we use P-K Type-A Phillips Recessed Head Screws in a metal-to-metal application."



Whatever your product or application . . . ferrous or non-ferrous castings, sheet metal or structural steel, plywoods, asbestos compositions, pliable or brittle plastics . . . Parker-Kalon can furnish the proper fastener to speed assembly, reduce rejects, cut costs!

*Sold Everywhere Through Leading Industrial Supply Distributors.*

*PARKER-KALON DIVISION, General American Transportation Corporation. Factory: Clifton, New Jersey.*

## PARKER-KALON® fasteners



**"A new press just wasn't in the cards..."**

**so we rebuilt this one and saved ourselves a lot of money!"**  
And it can be done with any Bliss press. Bliss has developed 42 modernization "packages"—pre-engineered assemblies—all you need to make an old press act young again. Add faster clutches, modern adjustments, more compact gearing, greater capacity. Do it in *your* own plant to keep downtime at a minimum. Or have Bliss do a complete rebuilding job for you.

Which is better? It's up to you. We'll give you the facts, but it's up to you. For here at Bliss, we consider the sale but the beginning of our responsibility. Which is what we mean when we say, "Bliss is more than a name... it's a guarantee."

**BLISS**  
SINCE 1857

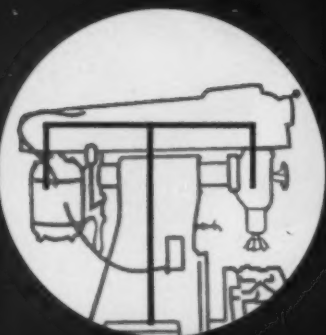
**E. W. BLISS COMPANY • Canton, Ohio**

*100 years of making metal work for mankind*

PRESSES • ROLLING MILLS • ROLLS • DIE SETS • CAN MACHINERY • CONTRACT MFG.

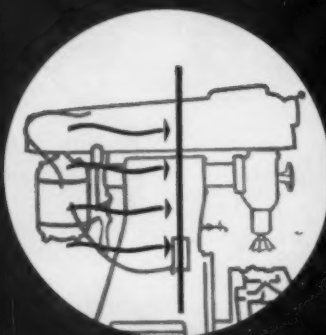


### BALANCED RIGIDITY



Motor mounted behind column balances weight of head, minimizes deflection.

### ISOLATION OF MOTOR VIBRATION



Column acts as baffle, keeping motor vibration away from head.

### MORE EFFICIENT POWER TRANSMISSION



Wide belt spacing permits use of B-section V-belt, more wrap-around on pulleys.



mill more  
accurately  
with the

## U.S. Vertical MILLING MACHINE

The *exclusive* motor mount design of the U. S. Vertical provides balance, rigidity and greater milling **ACCURACY!** And, check these **ADDED** features — all designed to aid in close tolerance work.

- Machine weighs 2000 lbs.
- Massive knee, saddle and table
- Extra wide bearing surfaces
- Tested and **CERTIFIED** ten ways
- Major castings are internally ribbed, normalized and stress relieved.
- Dovetails are deep and hand scraped
- Extra quill, knee, saddle and table travel

Write for your **FREE** copy of new U. S. Vertical Milling Machine Bulletin.

Builders of Milling Machines only

# U.S. Burke

MACHINE TOOL DIVISION

17 Brotherton Road • Cincinnati 27, Ohio

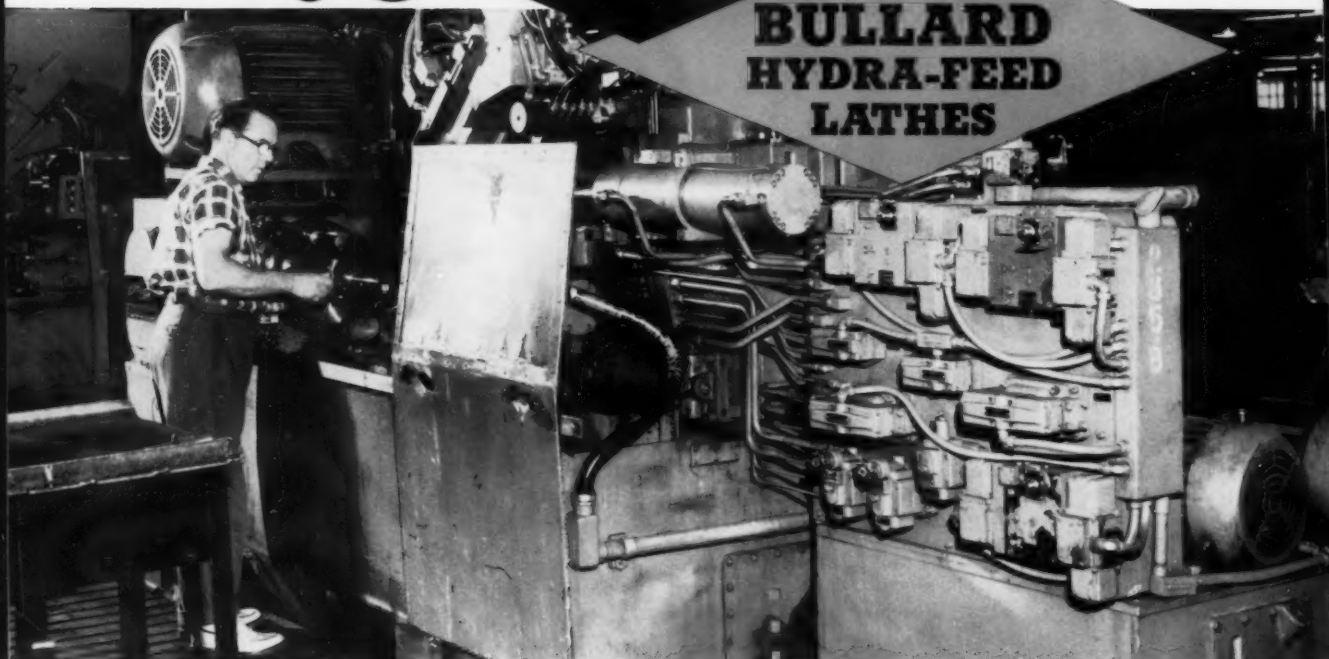
saves

**75%** on changeover time with ...

simplified  
set-up

on

**BULLARD  
HYDRA-FEED  
LATHES**



■ Illustrated below is one of more than forty different  
■ pinions processed on the same Bullard Hydra-Feed Lathes.

"Unless the consecutive set-ups from one job to another were similar," reports the Foreman of a large midwestern automotive parts manufacturer, "changeover set-ups took from ten to sixteen hours. But now, with Bullard Hydra-Feed Lathes, and going from one extreme to the other, the changeover is accomplished in less than four hours."

Additional reasons for their enthusiastic acceptance of Bullard Hydra-Feed Lathes include less spoilage, greater accuracy, better finishes and reduced machining time over previous method.

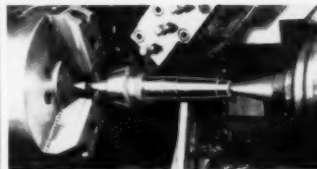
These advantages can be applied to your machining requirements. Call your nearest Bullard Sales Office for full particulars or write

**THE  
BULLARD  
COMPANY  
BRIDGEPORT 9, CONNECTICUT**

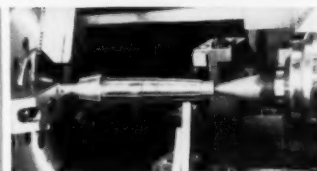
FIRST  
CHUCKING



SECOND  
CHUCKING



FINISHED  
PIECE



Remember—to cut costs when cutting metal—buy

**BULLARD**

# Quality is *inherent*, Service and Long Life *proven*...

## Philadelphia WORM GEAR REDUCERS

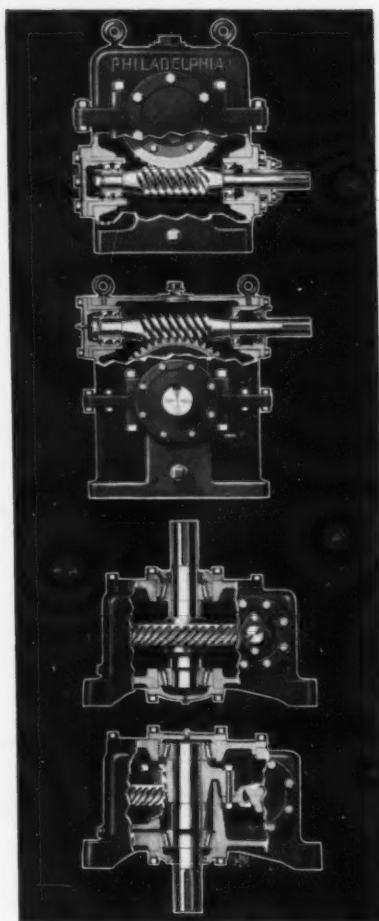
Whether you desire just worm and worm gear sets, or complete self-contained Worm Gear Speed Reducers — Phillie Gear is capable of meeting your most exacting requirements.

Philadelphia Worm Reducers are available in single or double reductions in horizontal right angle drive types, with the output shaft above or below the worm shaft — and in single or double vertical types, with output shaft extending up or down. Standard reductions in the single type are up to 90 to 1, and the double reduction types from 102 to 1, to 6300 to 1.

All sizes and types of Philadelphia Worm Reducers provide efficient, smooth and dependable power transmission under the most rigorous and severe operating service — Thousands are in daily use in industry throughout the World.

For detailed information, write for Catalog WG-562, and please use your Business Letterhead when requesting your copy.

### a type and size for any requirement



Type AT Philadelphia Worm Reducer driving 44" Up-cut Hot Shear.



Double Reduction type DVT Philadelphia Worm Gear Reducer on special down-shaft application.

## phillie gear®

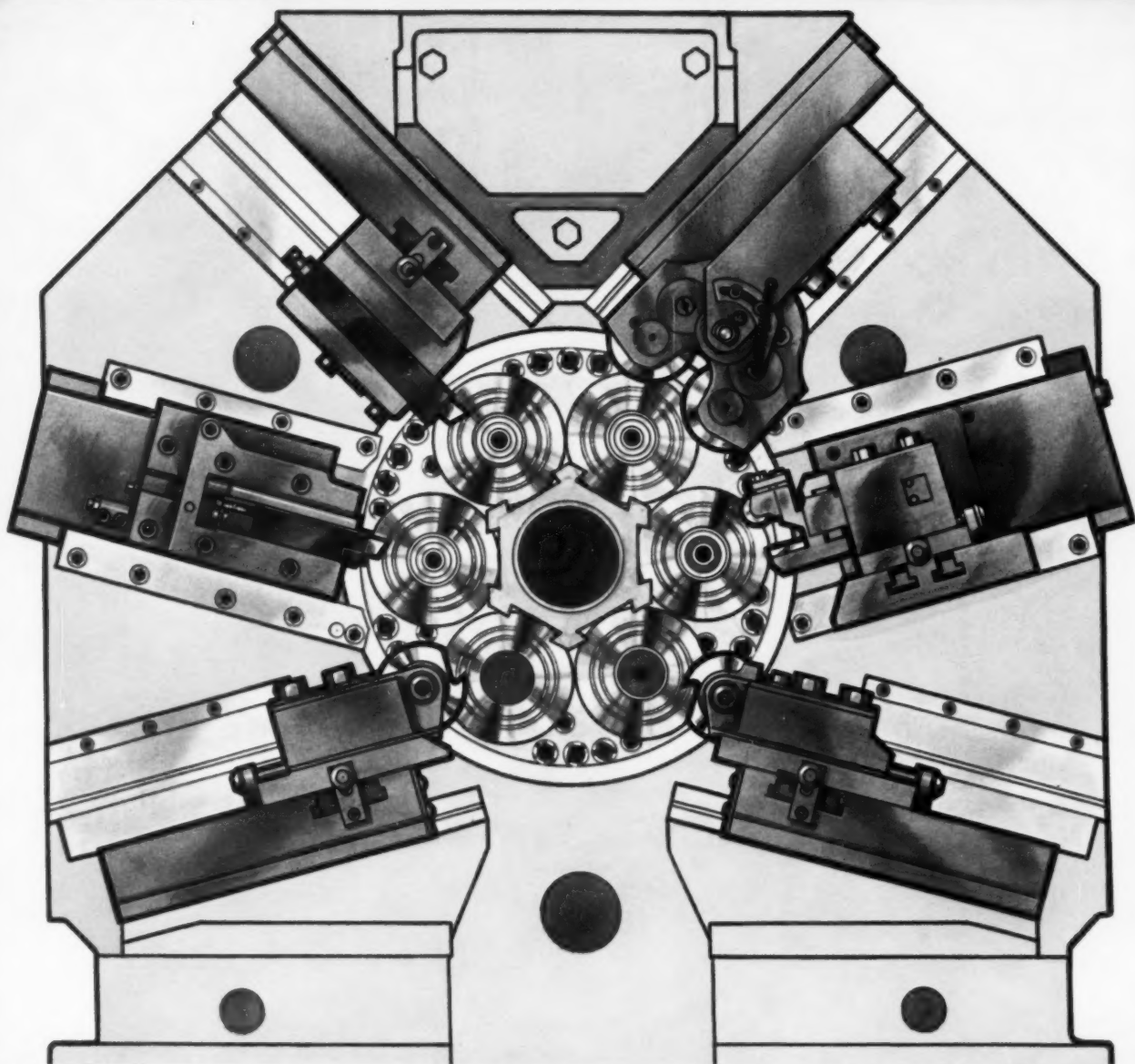
PHILADELPHIA GEAR WORKS, INC.

ERIE AVE. & G STREET, PHILADELPHIA 34, PENNA.

Offices in all Principal Cities

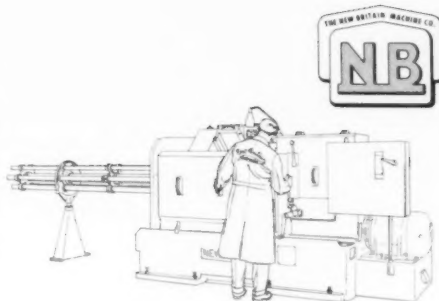
INDUSTRIAL GEARS & SPEED REDUCERS • LIMITORQUE VALVE CONTROLS • FLUID MIXERS • FLEXIBLE COUPLINGS

Limitorque Corporation • Philadelphia



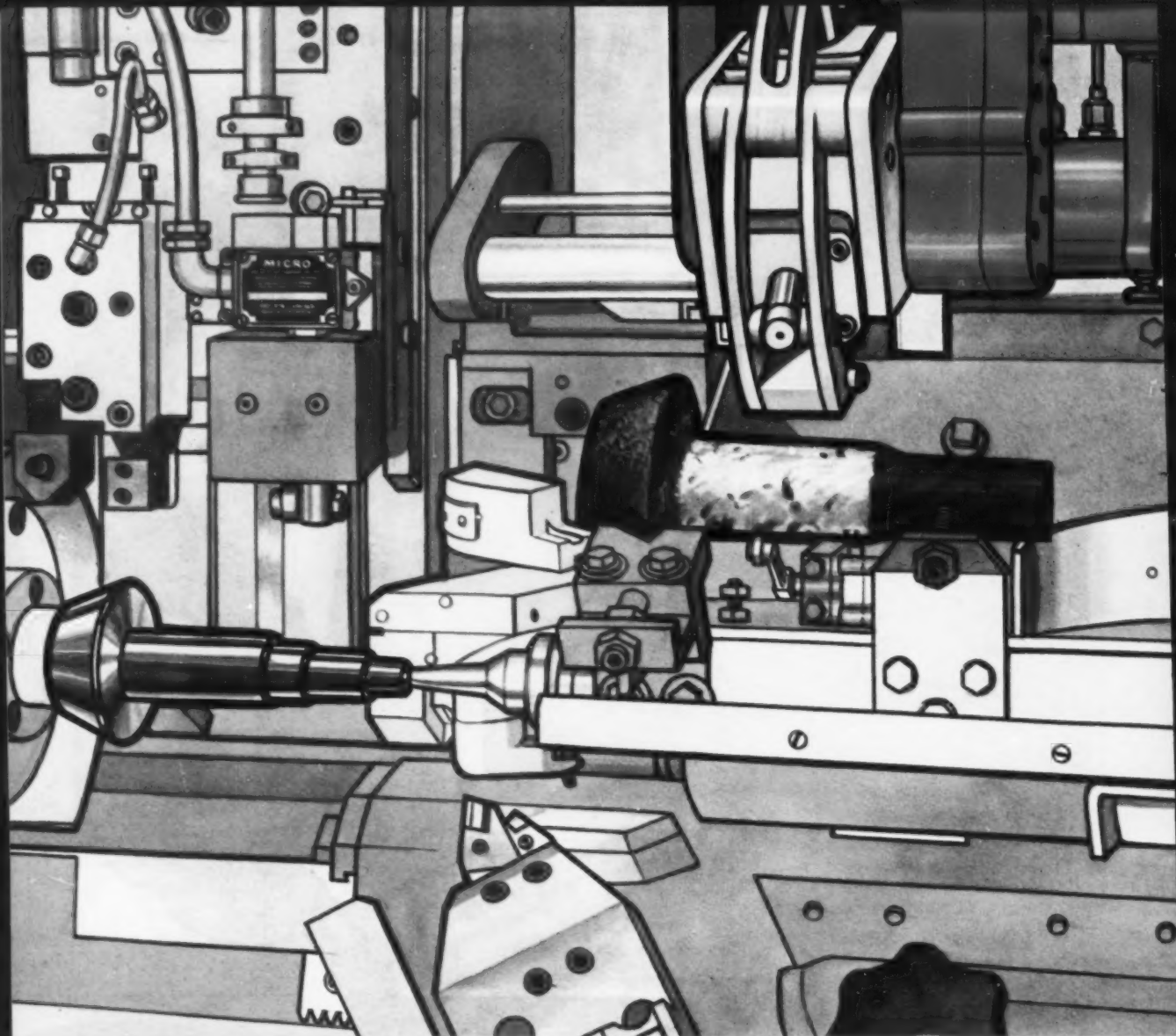
## six spindles — six cross slides

**H**ere you see the possibilities for new flexibility of bar machine set-ups with a *cross slide in every position*. Six independent cross slides. More operations on one bar machine. Six independent radial cross slides for forming, roll threading, shaving, skiving, angular facing, knurling, hobbing and undercutting with simpler tools and attachments, through the use of cross slides. The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.



Automatic Bar Machine

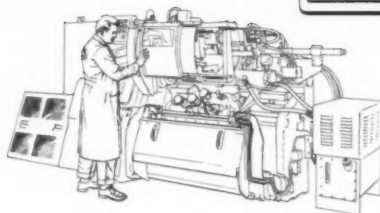




**no hands — no headaches**

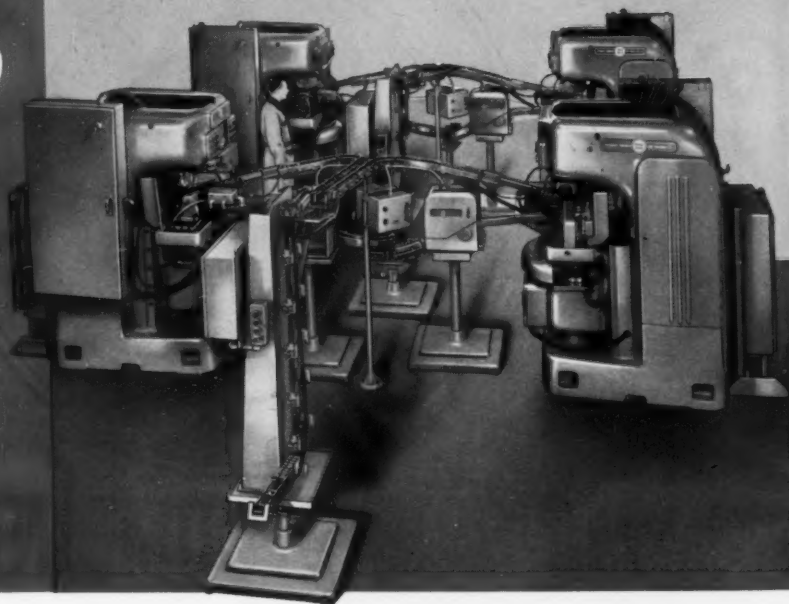
**A**utomatic loading of forgings, bar slugs and bar stock is a basic optional design feature of New Britain **+6F+** Copying Lathes. It saves labor and makes a substantial reduction in production time per piece.

Positive, accurate loading, single point tooling and template control mean fewer headaches and larger profits on your lathe work. The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.



**New Britain +6F+ Copying Lathe**

# FULLY AUTOMATED GEAR SHAVING CAN ALSO BE PERFECTLY FLEXIBLE



This fully automated installation shaves the split long pinion used in automatic transmissions. This pinion consists of two gear sections each of which is individually crown shaved. Output at full efficiency is 400 pinions (800 gear sections per hour).

The first pair of standard Red Ring Shaving machines processes one of the pinion sections. The second pair processes the other.

Automatic sizing gages perform a 100% check and reject any out-of-tolerance units.

Any individual shaving machine may be stopped at any time for cutter change or adjustment without interfering with the operation of the rest of the system. This is provided for by automatic switching in the feeder lines.

The flexibility of the supply and discharge lines greatly facilitate positioning the machines.

*Write for  
further details.*

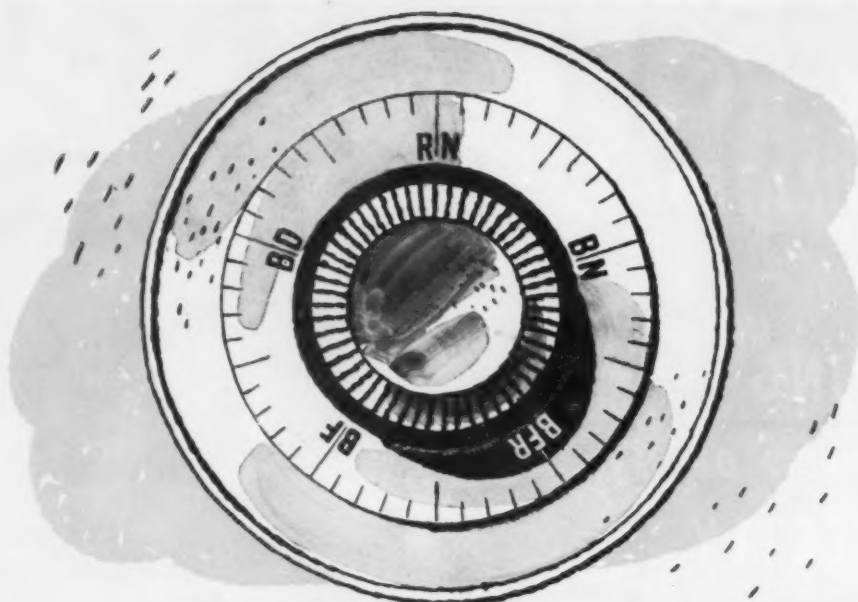
SPUR AND HELICAL GEAR SPECIALISTS  
ORIGINATORS OF ROTARY SHAVING  
AND ELLIPTOID TOOTH FORM



**NATIONAL BROACH & MACHINE CO.**

5600 ST. JEAN • DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT



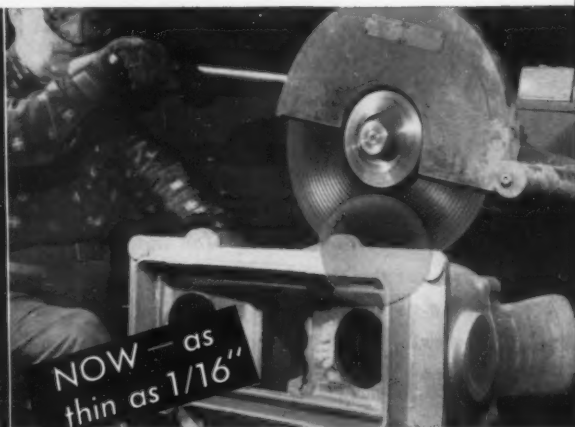
## Your "RIGHT COMBINATION" for countless grinding jobs

### The BIG 5 in Reinforced Wheels



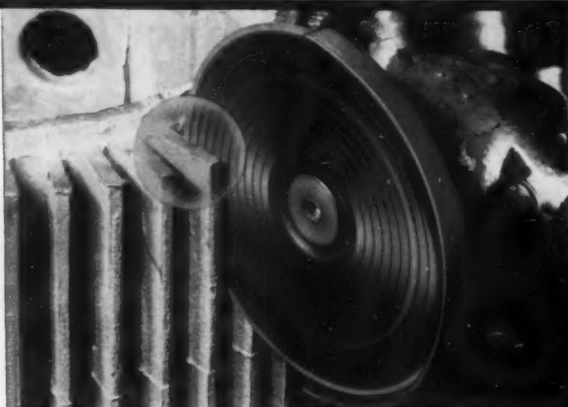
#### **RN WHEELS — Glass Cloth**

New — for the foundry and lower priced! Norton has been field-testing a new rubber-bonded-reinforced wheel. It's ready now and well worth your investigation for savings in your cutting-off operations on ferrous and non-ferrous metals.



#### **BN WHEELS — Glass Cloth**

Ten inch diameter wheels can now be had  $1/16$ " and  $3/32$ " thick. In this range specify A36TBN. For heavy duty work, requiring larger and thicker wheels, specify A24R14BN. Use them for slotting, for cutting-off non-ferrous metals, wire rope, many non-metallic materials.



### BD WHEELS — Glass-Nylon

For fastest cutting on right-angle grinders you'll want the glass cloth reinforced resinoid bonded hub wheels of rigid type. Use for medium to heavy weld grinding and smoothing flame-cut edges. Specify A24NBD for fast cut, A24QBD for long life. For cutting-off, A24RBD which is Nylon reinforced.



### BFR WHEELS — Cotton-Nylon

Top performers for light, portable grinding. These semi-flexible resinoid wheels have cotton fabric with an additional layer of Nylon for added safety. Specify A24KBFR for weld smoothing, removing scale, light finishing, minor cut-off jobs, etc.

**Norton  
Reinforced Wheels  
are built in many  
different varieties  
... to add the  
"TOUCH OF GOLD"  
in many different ways**

There's no limit to what the complete line of Norton reinforced wheels can do for you, in the widest range of everyday grinding jobs — from light deburring to heavy cutting-off.

That's because each type combines exactly the right abrasive, reinforcing web and bond to assure exceptional strength and safety — plus fast, cool, trouble-free performance. Remember: only Norton offers you such long experience in both grinding wheels and grinding machines . . . which means these particular wheels are sure to bring you the money-saving, value-adding "Touch of Gold" on job after job, day after day.

Also, Reinforced Mounted Wheels and Sticks are available. Here we show just five of the popular reinforced wheel types. For plenty of further facts, read our Booklet No. 1748. Get it from your Norton distributor — together with fast, helpful service. Or write to NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors all around the world.



### BF WHEELS — Cotton

These resinoid straight wheels with cotton fabric reinforcement are "the right combination" for peripheral grinding, do a fine job of deburring and finishing. Fine for blending and smoothing light welds. Also available in mounted wheels and sticks.

W-1814

**NORTON**  
**ABRASIVES**

*Making better products... to make your products better*

#### NORTON PRODUCTS

Abrasives • Grinding Wheels • Grinding Machines • Refractories  
BEHR-MANNING DIVISION  
Coated Abrasives • Sharpening Stones • Behr-cat Tapes



*A new line*

# RYK

*Major breakthrough in grease technology results in development of new thickening agent. New grease has greater high temperature stability, superior multi-purpose qualities, improved lubricating properties.*

**Check Chart Of RYKON Greases**

Regular Line	Grade Consistency
RYKON Grease No. 0....	0
RYKON Grease No. 1....	1
RYKON Grease No. 2....	2
RYKON Grease No. 3....	3

**Heavy Duty Line**

RYKON Grease No. 0 E.P.	0
RYKON Grease No. 1 E.P.	1
RYKON Grease No. 2 E.P.	2



**STANDARD OIL COMPANY (Indiana)**

# *of Standard Oil greases*

# RYKON GREASE

Standard Oil instituted a grease research and development project several years ago. The result of this work is the line of RYKON Greases, which contain a new non-soap, organic thickener.

RYKON Greases surpass in stability and performance the best greases made up to this time. They bring to industry new opportunities for improved machine performance. They greatly reduce maintenance and grease handling problems.

## **RYKON Grease Properties**

RYKON Greases are smooth, buttery-textured greases, made from the finest quality, solvent-extracted oil. Their thickening agent is a Standard Oil exclusive. RYKON Greases have these high-quality characteristics:

**High temperature stability**—Better heat stability than any other petroleum oil grease. ASTM dropping point of 480°F. Maintain consistency in service at high temperatures.

**Mechanically stable**—Maintain consistency even under severe mechanical working.

**Chemically stable**—Inhibit oxidation. Oil and thickening agent in combination possess extremely good chemical stability.

**Oil separation**—Minimum bleeding of oil in service and storage.

**Wide temperature range**—Lubricate at high and low temperatures. Extended range of application thus obtained makes RYKON Greases truly multi-purpose.

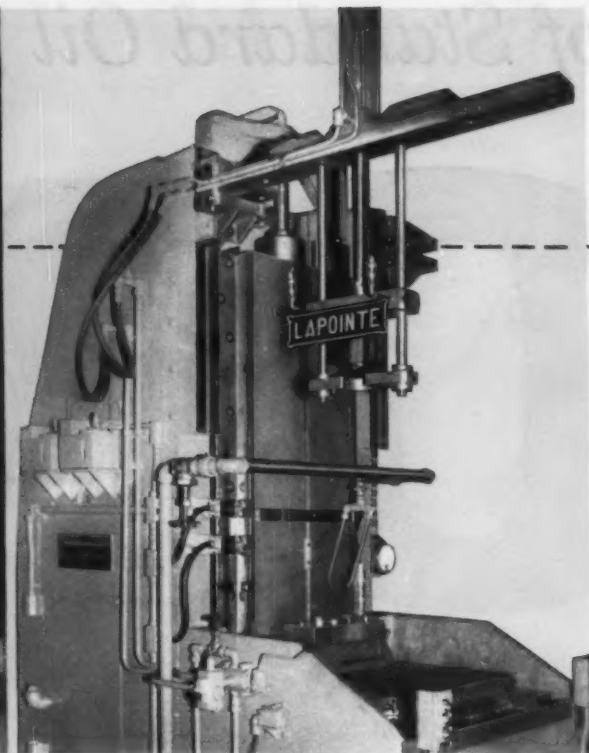
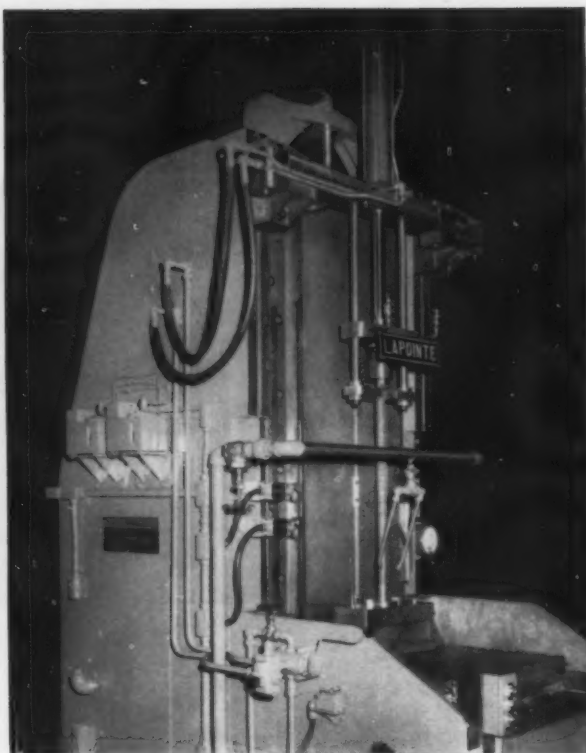
**Water resistance**—Do not lose consistency in presence of water. Resists water washout.

**Anti-rusting**—Exceptional natural rust preventive characteristics.

With RYKON Greases, lubrication can become simple, foolproof and less expensive—much less expensive, perhaps, than a single shut down caused by equipment failure due to the use of the wrong grease or the use of an "economy" grease.

RYKON Greases come in four Regular and three Heavy-Duty grades. Thus there is a RYKON Grease to take care of every grease lubrication job. Using RYKON Greases plant-wide can reduce your grease storage requirements, simplify lubrication maintenance training, cut down record keeping, save on dispensing equipment and reduce investment in grease inventories.

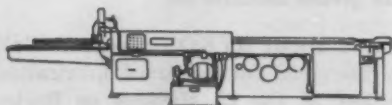
Get more facts about RYKON Greases. Call your nearby Standard Oil industrial lubrication specialist in any of the 15 Midwest or Rocky Mountain states. Or write Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.



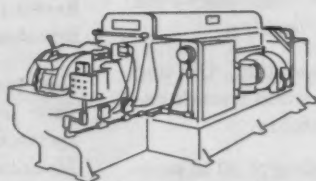
Internal splines and all types of round and irregular holes can be accurately broached to extremely fine tolerances on this Lapointe Broaching Machine, as shown here with special attachment in position for pull-down broaching. Bracket can be moved up or down to accommodate different length broaches . . . puller and lifter mechanism provides automatic handling of the broaches . . . the machine can easily be adapted for use of multiple broaches.

Forms in the periphery of turbine discs and practically any other type of surface broaching can be performed on the same Lapointe SRVE Broaching Machine by swinging aside the broach-lifting bracket and proceeding as with a conventional surface broaching machine. This one has the outstanding Lapointe electro-mechanical drive which accounts for extreme smoothness of operation. Capacity 30 horsepower, 72-inch stroke.

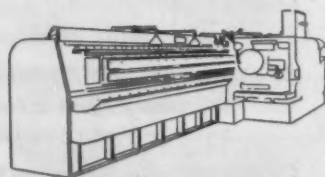
**Here's a line of ELECTRO-MOTIVE DRIVE BROACHING MACHINES . . . . available only at LAPOINTE**



**60" STROKE HORIZONTAL, ELECTRIC**



**CH CONTINUOUS BROACHING, ELECTRIC**



**SRHE SINGLE RAM HORIZONTAL, ELECTRIC**

and speaking of **versatility** in broaching machines, here's one that leads a

## **DOUBLE LIFE!**

You can do both internal and surface broaching on this Single Ram Vertical Electric

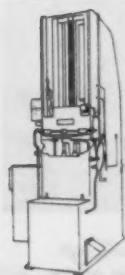
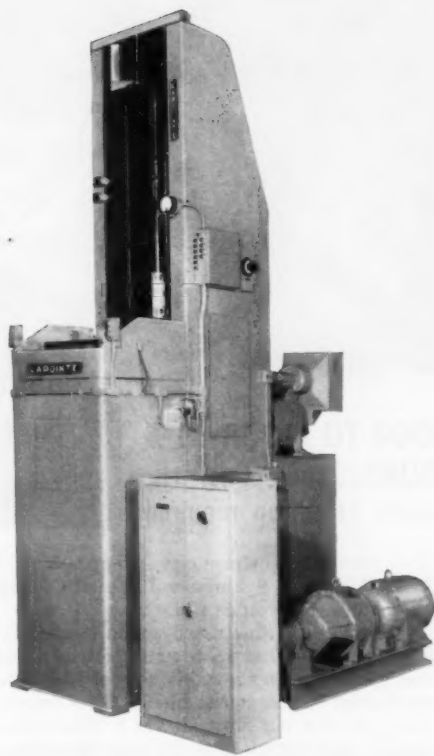
### **LAPOINTE** — **BROACHING MACHINE**

Doing the work of two types of machines, you can now get virtually two machines for the price of *one*. That's because this Lapointe SRVE Broaching Machine is built with a special broach-lifting mechanism that can be swung out of the way when changing over to surface broaching. *It's as simple as that!*

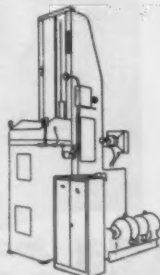
Lapointe engineers have pioneered again — they developed the technique of using a conventional surface broaching machine for *internal* broaching also. This sort of advance-thinking in broaching has been going on for more than 55 years. No other company has accumulated as much valuable experience in the broaching industry, so why shouldn't you expect — *and get* — the most from Lapointe? Ask one of the qualified Lapointe Field Engineers to call on you and explain the money-making features of Lapointe-Broaching, and especially this machine that leads a double life.

**THE LAPOINTE MACHINE TOOL CO.**  
HUDSON, MASSACHUSETTS • U.S.A. In England: Watford, Hertfordshire

**THE WORLD'S OLDEST AND LARGEST MANUFACTURERS  
OF BROACHING MACHINES AND BROACHES**



VUE-7 VERTICAL  
PULL-UP ELECTRIC



SRVE SINGLE RAM  
VERTICAL, ELECTRIC



DRVE DOUBLE RAM  
VERTICAL, ELECTRIC

## **LAPOINTE**

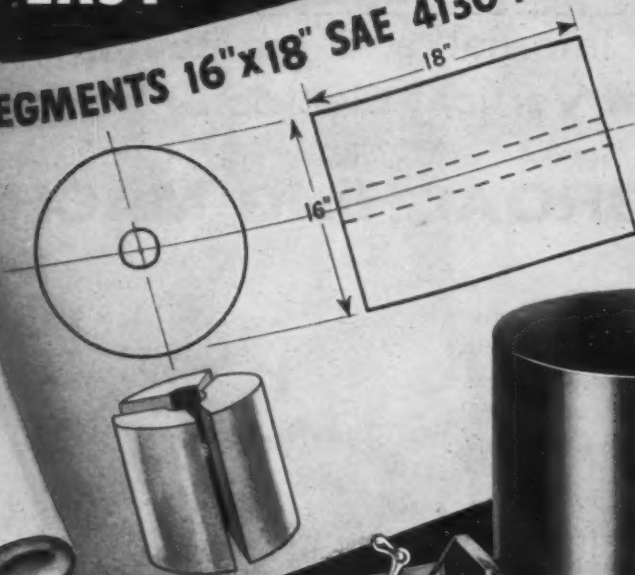
known to be the best in  
**BROACHING**



# MARVEL<sup>NO. 8</sup> BAND SAW

makes a tough job  
**EASY...**

SEGMENTS 16"x18" SAE 4130 FORGING



**FLOOR TO FLOOR IN 5 HOURS...** no special jigs, fixtures or set-up required

The versatility, simplicity of operation and unmatched efficiency of a MARVEL No. 8 Universal Metal Cutting Band Saw makes it the best all-around saw you can buy.

Take the job illustrated, as an example. Three equally spaced re-entrant cuts were required to segment a large, heavy die forging. The work was merely placed on the table between the vise jaws with the first lay-out line positioned to bisect the blade. Feed pressure was set on the direct-reading scale and the cut started. On a MARVEL No. 8, the work is always stationary and the blade is fed into the work; the cutting edge of the blade is always square with the table throughout its full feed traverse, which eliminates the need for special fixtures. The pre-set Automatic Overload-Relief Power Feed kept the blade moving into the work only as fast as it could freely remove the metal; as the vertical length of the cut decreased, the blade was automatically fed faster, thus increasing cutting speed. Upon completion of a cut, the blade was rapidly returned to its starting position by a rapid traverse handwheel located at the operator's position. Succeeding cuts were made in the same manner, with the same ease and speed.

Jobs like this aren't done every day, but they serve to emphasize the versatility of the MARVEL No. 8, a truly universal metal cutting saw. If you cut, machine or fabricate metal, this is a sawing machine you should know about. Write for catalog.

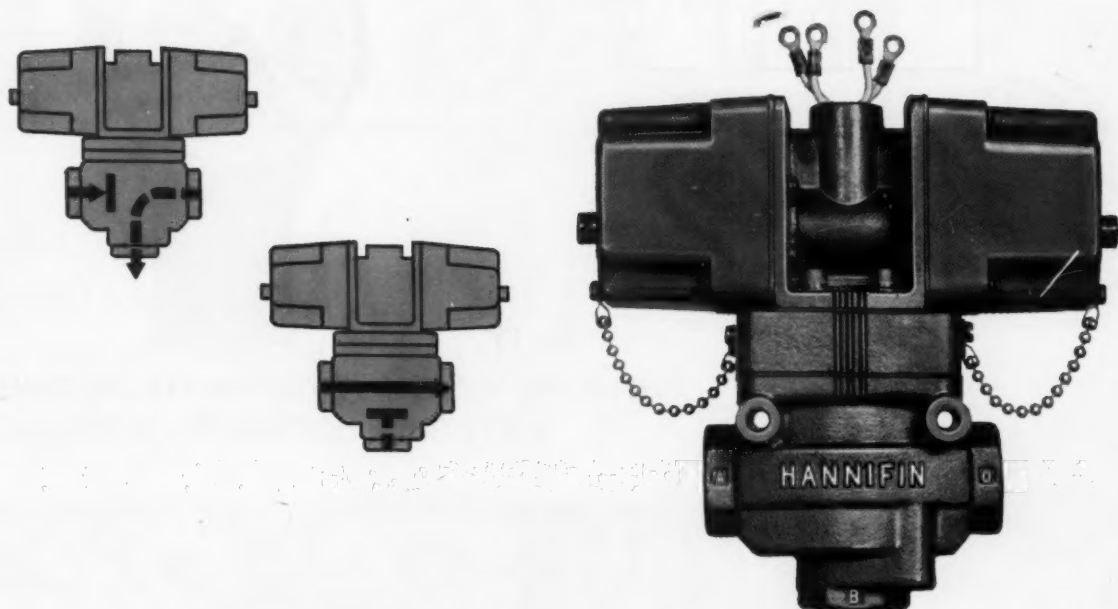
**ARMSTRONG-BLUM MFG. CO.**  
5700 BLOOMINGDALE AVE. • CHICAGO 39, ILL.

**MARVEL** Metal Cutting  
**SAWS**  
Better Machines—Better Blades

S-1302

Setting the pace for automation

...Hannifin valves



**Automatic processes** call for speed, sensitivity and flexibility in directional air control. Above all, they demand dependability. That is why so many valve users find it pays to choose Hannifin.

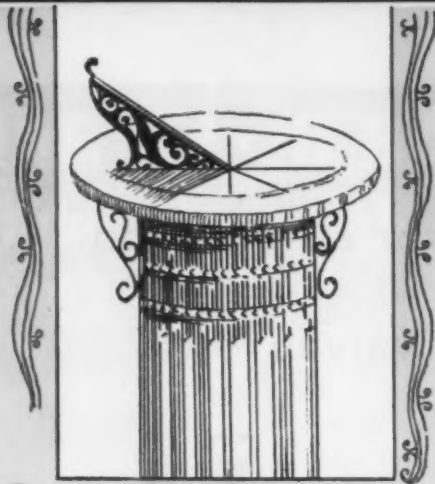
Every feature that contributes to dependable performance has been incorporated in Hannifin air control valves. This dependability is the result of never-ending research and development.

In the broad Hannifin line, you will find valves with new exclusive features...valves for practically any kind of automatic sequential operation. All are simple in design, with few and easily replaceable parts.

AIR CONTROL  
**HANNIFIN**  
VALVES

For this complete catalog showing all the Hannifin directional air control valves, write to Hannifin Corporation, 509 South Wolf Road, Des Plaines, Illinois.





*Great in its day...*



BUT  
WOULDN'T YOU RATHER HAVE THE  
LATEST TECHNICAL ADVANCE?

**Heller**

*"Job Tempered"*

*cuts tool making costs 4 ways:*

**Flat  
Ground Die Steel**

A great new addition to Heller's famous tool line — "Job Tempered" Flat Ground Die Steel — offers solid, cost-cutting advantages to users in four specific ways:

1. **Over 1300 standard stock sizes available** provide the right size for the job — minimum waste in cutting to size — maximum utilization of each piece.
2. **Requires no pre-finishing.** Tool patterns may be laid out directly on its super-smooth 25-35 micro-inch surface.
3. **Easy to machine.** Spheroidize annealed structure

of this high grade alloy steel saves time in making the actual tool.

4. **Easy to heat-treat.** Wide hardening ranges make heat treating non-critical. Simple instructions on every package show how to "Job Temper" the tool to get maximum service life and performance on the job.

You get extra assurance that "Job Tempered" Die Steel is *right* because the analysis has been checked and recommended by leading consulting metallurgists. All these advantages add up to real cost-savings in making tools . . . and maximum tool performance under the toughest service conditions.

wide range of standard and stock sizes available in oil hardening and air hardening types

	Oil Hardening	Air Hardening
Lengths	18" and 26"	36"
Thicknesses	$\frac{1}{4}$ " to $1\frac{1}{8}$ "	$\frac{1}{8}$ " to 2"
Widths	$\frac{1}{2}$ " to 14" depending on length and thickness	1" to 10"

Stock squares also available.

useful, convenient protective packaging

All sizes are individually packaged, fully protected from rusting and scratching. Analysis, heat treating instructions and dimensions are clearly indicated on every package.

# GET THIS HANDY SELECTION CHART!

Shows at a glance the complete range of standard and stock sizes and stock squares of Heller "Job Tempered" Die Steel available from your Heller Distributor.



HANG IT ON YOUR WALL  
FOR QUICK, EASY REFERENCE.



# Heller nucut



HELLER TOOL CO. America's Oldest File Manufacturer  
Newcomerstown, Ohio A subsidiary of Simonds Saw and Steel Co.

*the analysis  
recommended  
by leading  
consulting metallurgists*

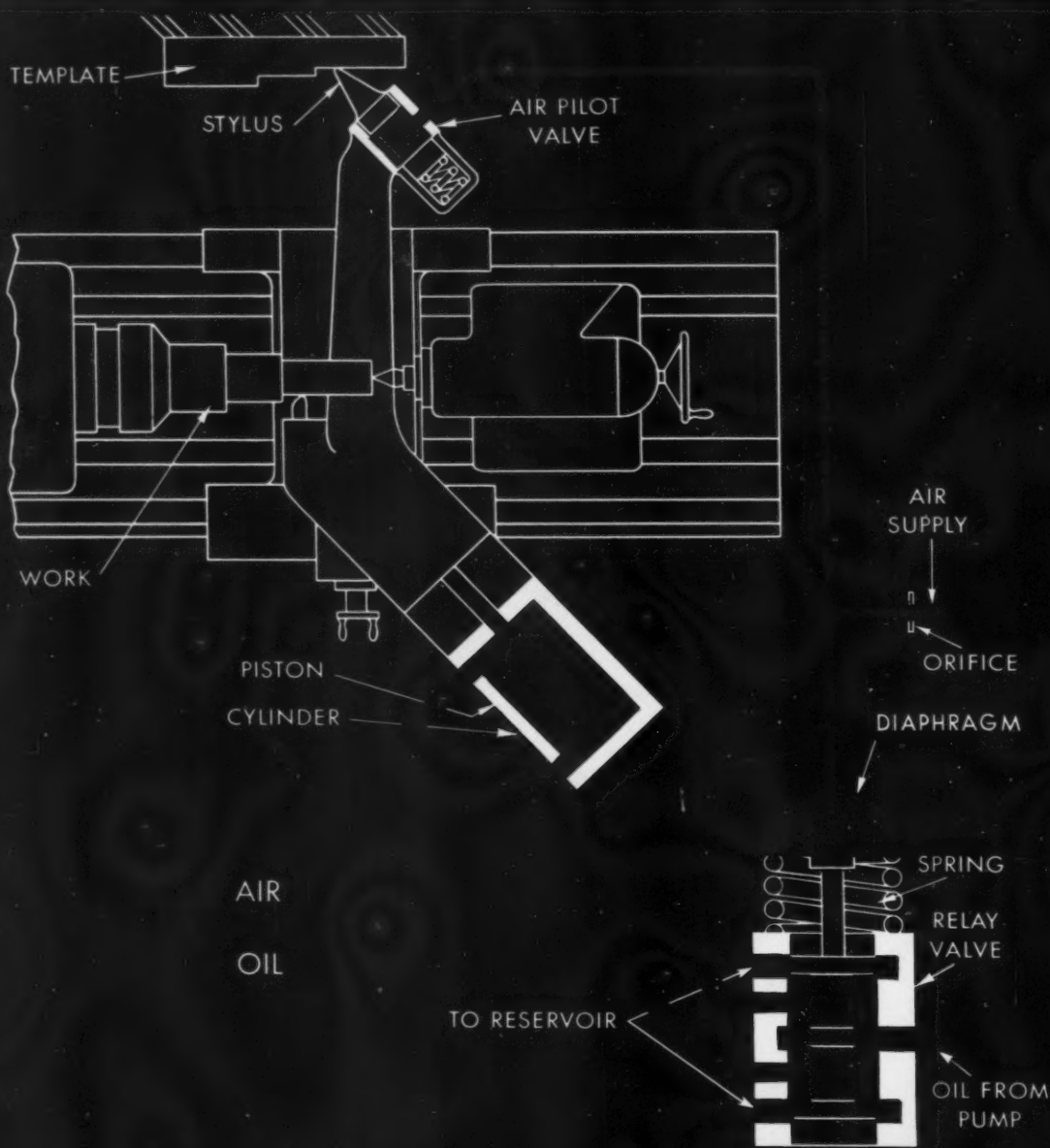
SOLD EXCLUSIVELY THROUGH

Heller  
DISTRIBUTORS  
"YOUR OUTSIDE TOOL ROOM"  
SERVICE + STOCKS = SAVINGS



# *It's a breeze*

**to cut costs, boost production and  
quality with the Monarch "Air-Gage Tracer"**



The above diagrammatic drawing shows the simplicity of Monarch "Air-Gage Tracer" operation. As the design deals with both air and oil in constant motion, reaction

in the power cylinder is within a few thousandths of a second after the tracer changes position. Result —super-accuracy piece after piece, job after job.

No lathe development in recent years has equaled template controlled turning for substantial cost reduction. Its advantages, when performed the Monarch "Air-Gage Tracer" way, are many. This duplicating method:

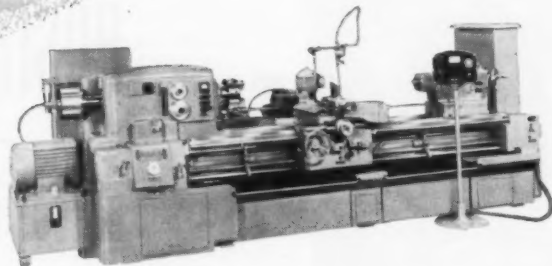
- Always outproduces a manually operated machine; in some instances as much as 8 to 10 times.
- Provides automatic sizing, thereby reducing spoiled work to the absolute minimum.
- Imparts a smooth, stepless finish on any combination of cuts, whether turning, facing or boring.
- Often halves amount of stock left for grinding; sometimes eliminates grinding and polishing operations.
- On most work, reproduces accuracy of template within  $\pm .001"$ .
- Eliminates the need for expensive form tools and the cost of multiple tool setups.

- Allows a complete setup change in as little as 15 to 20 minutes; tool change in 1 minute.

Write for complete descriptive booklet No. 2608. It contains dozens of typical job examples . . . **The Monarch Machine Tool Company, Sidney, Ohio.**

### Exclusive Features of the "Air-Gage Tracer"

- 1 The only lathe duplicator which utilizes the combination of air-hydraulic control. That's the secret of its super-accuracy.
- 2 The air circuit is an open loop servo system which provides air-gaging and multiplies both force and motion.
- 3 It's the simplest and most trouble-free of all lathe duplicating methods. Tracer head maintenance is never a costly problem.
- 4 Stylus pressure against template is only 5 to 6 ounces, practically eliminating template wear.
- 5 Either a flat or a round template may be used. Excepting on very small lot, non-repetitive runs, the flat template has many advantages. Never is it necessary to use a large, bulky round template so that it can be indexed periodically due to excessive wear from high stylus pressure.
- 6 Available both in a rigid and swiveling type, the latter of which may be used at any setting between  $45^\circ$  and  $90^\circ$ . Universal nature of swiveling type a "must" for top production on many complex facing and boring operations.
- 7 The only lathe duplicator offered optionally with full automatic cycling and potentiometer feed control.
- 8 Backed by almost 30 years' experience in the field of tracer controlled turning. Thousands of "Air-Gage Tracer" lathes attest to its acceptance by industry everywhere.



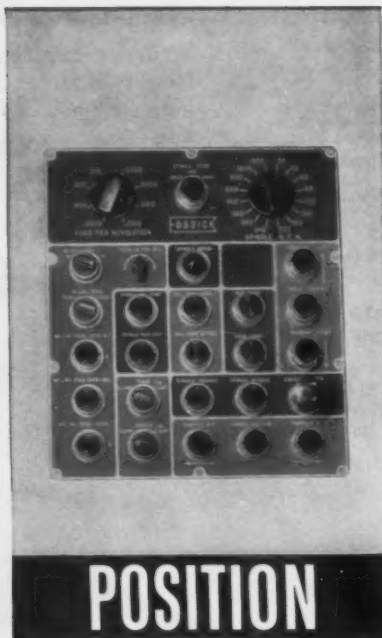
Above is a Monarch Series 62 Preselector Dyna-Shift Lathe with "Air-Gage Tracer" and auto cycle unit. This duplicating means may be factory applied to all lathes in the Monarch line. They may be converted to conventional manual operation merely by the flick of one lever. The "Air-Gage Tracer" is also the heart of such Monarch production lathes as the Mona-Matic, Hydra-Slide and Right Angle.

**Monarch**  
TURNING MACHINES  
FOR A GOOD TURN FASTER  
... TURN TO MONARCH



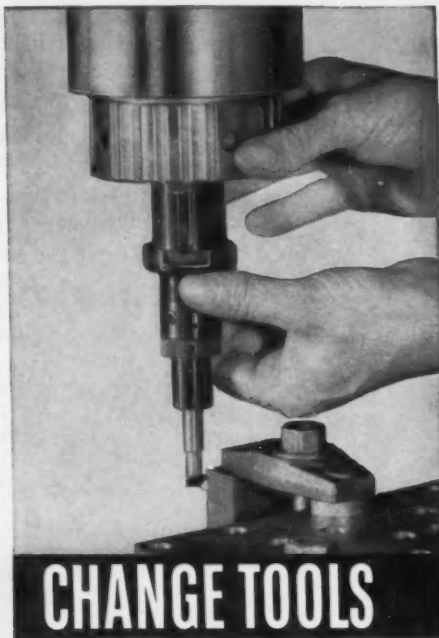
## MEASURE

*Dial dimension direct from print.* There are two sets of direct-reading drum dials, one for longitudinal, the other for transverse position. Operator simply sets dials so that numbers on dials correspond with numbers on blueprint. Simple. Direct. Precise.



## POSITION

*Press two buttons, one for longitudinal, one for transverse positioning.* Table, and work, are automatically positioned, and clamped under the tool, accurate to  $\pm .0001$ "! Accuracy is dependent upon highest-quality gages, not upon screw threads. Sensitive .0001 Dial Indicators maintain a positive check at all times.



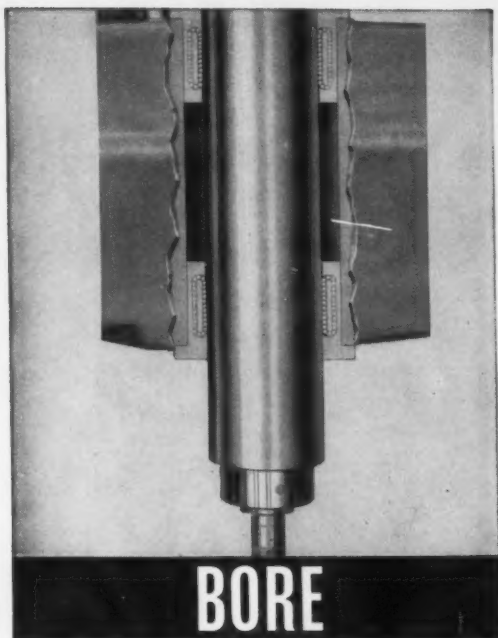
## CHANGE TOOLS

*Tool changing takes less than 10 seconds, with BF spindle.* Can be accomplished while table is positioning. Hole sizes are repeated within  $\pm .0001$ ", without re-setting tools! High-precision tool holder is built right into the spindle of the Jig Borer. Adapters accommodate both standard and special-sized tools.

# FOSMATIC JIG BORER

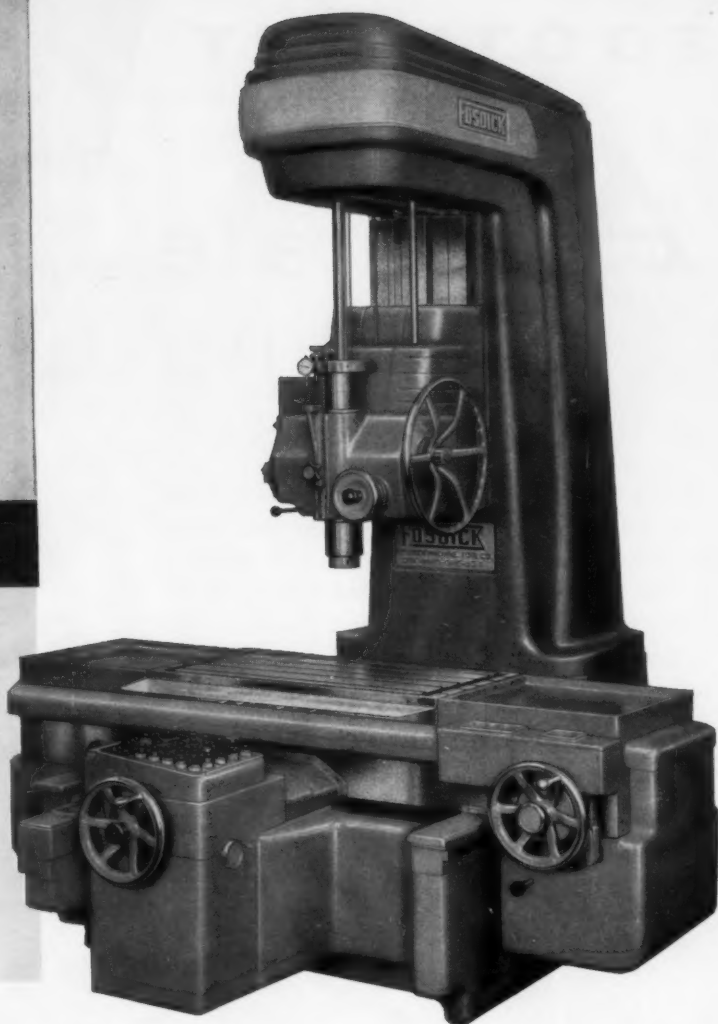
## AUTOMATIC POSITIONING

## DIRECT DIMENSION MEASURING



## BORE

*Push-button precision boring.* For finish boring, change tools quickly, then bore a touch of button. The hardened alloy steel quill rides on 800 preloaded balls mounted in precision bushings located permanently at top and bottom of head—as close as possible to spindle nose for maximum rigidity. Spindle is guaranteed not to exceed .0002" runout at the end of 12" proving bar!



## MEASURE - POSITION - CHANGE TOOLS START BORING... ALL IN SECONDS!

*hole size and position accurate to  $\pm .0001$ .*

The new FOSDICK Jig Borer can be used for the finest toolroom boring or for production of precision holes. Like the scores of FOSDICK Jig Borers in plants throughout the United States, this machine will perform consistently to  $\pm .0001$ " . . . in measured table and saddle position as well as hole size.

The FOSMATIC Jig Borer is extremely simple to operate. Changing of feeds and speeds, all movements of the table, saddle, and head can be accomplished by push button. Spindle is started and stopped by lever on head. Machine may be equipped with or without automatic positioning. Can be equipped for numerical control with either tape or card systems.

Other features available as extra equipment include Milling Feed, Rapid Traverse to Quill, coolant system and reversing motor for tapping.

Ask for FOSMATIC Jig Borer Bulletin, JB-M.



FOSMATIC  
Radial Drills



Jig  
Borers



Sensitive and  
Upright Drills



Sensitive  
Radial Drills



Jig  
Grinders



Automatic Positioning  
Jig Borers

NEED DRILLING EQUIPMENT?  
GET A PROPOSAL FROM FOSDICK!

# FOSDICK

THE FOSDICK MACHINE TOOL CO.  
CINCINNATI 23, OHIO



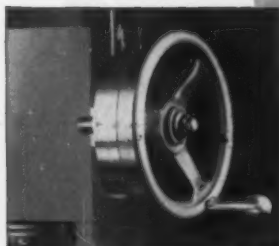
# FOOTBURT

## Accurate grinding for small parts

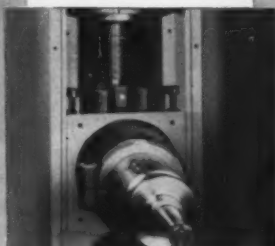
The Hammond No. 2, 6" x 18", Surface Grinder is a precision tool room machine for use on the most accurate gauge and tool work. The standard spindle is direct motor driven and is mounted on precision preloaded ball bearing. Total vertical adjustment is 10 $\frac{3}{4}$ ". In and out movement of table is 6 $\frac{1}{2}$ " with a longitudinal travel of 18".

**THE FOOTE-BURT COMPANY • Cleveland 8, Ohio**

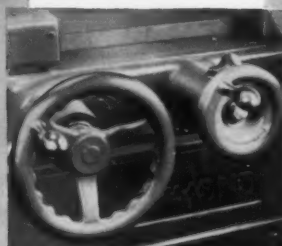
Detroit Office: 24632 Northwestern Highway, Detroit 35, Mich.



**Accurate Spindle Adjustment**—Standard vertical adjustment of spindle through handwheel is .0005". With Vernier attachment, spindle can be raised accurately to .00005".



**Solidly Supported Spindle Carrier**—Spindle carrier is moved vertically on double dovetail ways with adjustable tapered gibs.



**Convenient Hand Control**—Handy wheels for cross travel, accurately gauged to thousandths, and quick acting longitudinal travel.



**Smooth Roller Chain Table Drive**—Remarkably smooth finish on work, without chatter marks frequently found when table is moved by conventional means through rack and pinion.

# FOOTBURT

## SURFACE GRINDING

Write for  
Circular #13A.

VANADIUM-ALLOYS STEEL COMPANY

steels that translate quality into performance

# DIE STEELS

FOR

# cold work

Your assurance of providing the finest quality Cold Work Die Steels for your shop is integral in every pound of our products. Vanadium-Alloys Die Steels feature uniformity of quality unvarying from one shipment to another—uniform in structure, uniform in response to heat treatment, uniformly free from defects so that your expensive dies are free from trouble. • You can cover the maximum number of die applications with these three favorite steels. Keep them on hand in the sizes your jobs require—and let Vanadium-Alloys quality do the rest!

## Ohio Die

Lowest movement in hardening. High in strength and toughness. Outwears low alloy steels five to eight times. Air or oil hardening. Available in FM (free-machining) type also. Stocked in all warehouses.

## Air Hard

General purpose, deep hardening, exceptional strength and toughness. Hardens in still air to Rockwell 65, with much lower movement than manganese types. Also available in FM (free-machining) type. Available from stock in all warehouses.

## Colonial No. 6

The best cold work die steel for general toolroom purposes—tops in versatility. Manganese oil hardening, specially annealed for easy machining. Stocked in all warehouses.

## VANADIUM-ALLOYS STEEL COMPANY

LATROBE, PENNSYLVANIA

**SUBSIDIARIES:** Colonial Steel Co. • Anchor Drawn Steel Co. • Pittsburgh Tool Steel Wire Co. • Vanadium-Alloys Steel Canada Limited • Vanadium-Alloys Steel Società Italiana Per Azioni • **EUROPEAN ASSOCIATES:** Societe Commentryenne Des Aciers Fins Vanadium-Alloys (France) • Nazionale Cogne Società Italiana (Italy)

# KING-SIZE DIE

## ... on CINCINNATI PRESS BRAKES

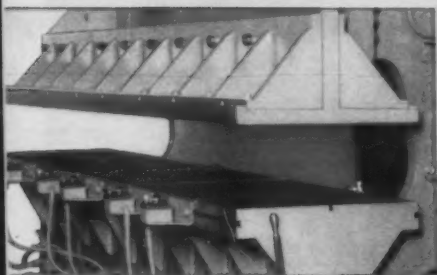
More and more jobs requiring large die areas are being done on Cincinnati Press Brakes. Such jobs include punching, trimming, notching, forming, drawing, blanking and embossing. The "King-Size" die area needed for such jobs can be provided by permanently widening the bed and ram, or by using removable brackets ... as the individual requirements dictate.

Maximum versatility is obtained by using removable brackets—either on the ram alone or on both the bed and ram. This

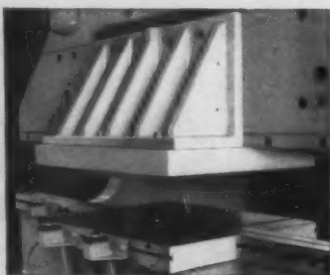
gives you a dual-purpose machine: for Press work (with brackets mounted) or for Brake work (with brackets removed.)

This kind of versatility puts money in your pocket, since it broadens the range of jobs that can be done on each Cincinnati Press Brake.

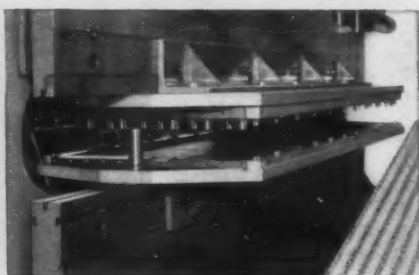
Investigate! Our Application Engineers will be glad to advise you on the profit and production possibilities in your shop. Write Department D for Press Brake Catalog B-5.



This Press Brake is equipped with large area, removable brackets on the ram. The entire bed has been permanently widened.



A portion of the bed of this Press Brake has been permanently widened. The ram is equipped with short, removable brackets.



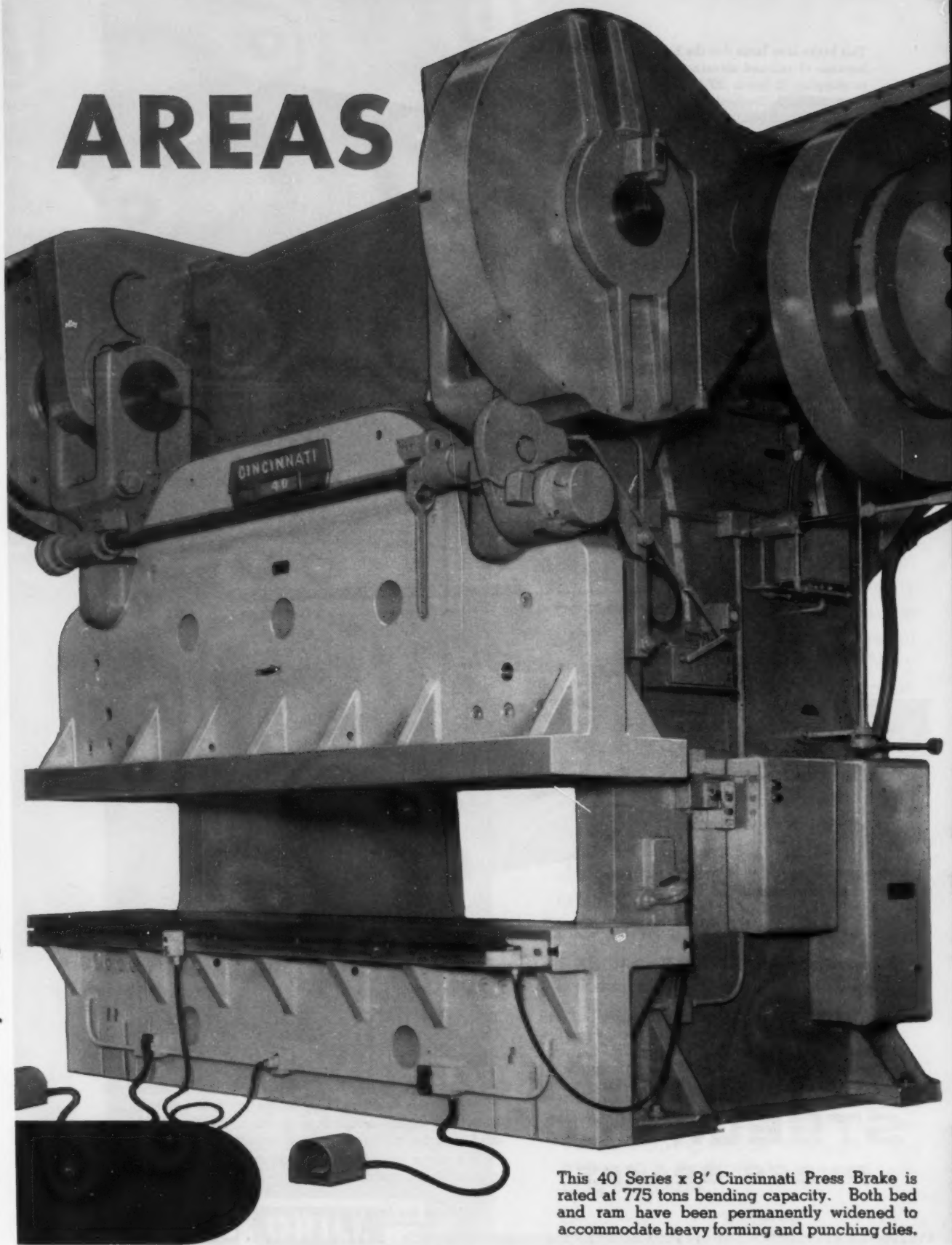
Both the ram and the bed of this Press Brake are equipped with large area, removable brackets.



### THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS · SHEARS · PRESS BRAKES

# AREAS



This 40 Series x 8' Cincinnati Press Brake is rated at 775 tons bending capacity. Both bed and ram have been permanently widened to accommodate heavy forming and punching dies.



This brake is so large that the bed had to be detachable because of railroad clearance limitations encountered in shipping. It bends 20'-0" x 1/2" steel plate and is equipped with Steelweld's own tried-and-proven air-operated clutch and brake.



## STEELWELD

### BUILDS LARGE PRESS BRAKES

Regardless of Size — Small or Large — Steelwelds Have Much to Offer

**A**LTHOUGH Steelweld Brakes are built in a wide range of sizes, it is in the large classification where Steelweld's many fine features really show up. Brakes used for forming long plates—15, 20, 25 feet—or for working metal

thicknesses of 1/4 inch to 1 1/2 inch, must be quality built to operate day in and day out on a continuous production schedule.

The entire line of Steelwelds is heavily built to withstand hard, rugged service. Steelwelds have all the features that make for fast set up, easy operation, accuracy of work, high output and simple infrequent maintenance.

We urge you to get the facts on these fine, quality-built machines.

## STEELWELD PRESS BRAKES

Write for free copy of Catalog No. 2010

STEELWELD DIVISION • THE CLEVELAND CRANE & ENGINEERING CO. 5466 E. 281 ST. • WICKLIFFE, OHIO



U. S. NAVY PHOTO

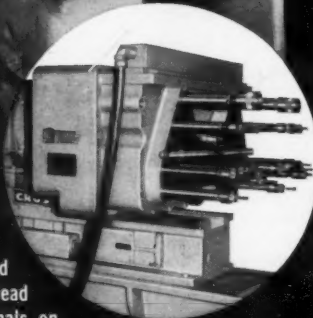
## Trouble Spotter...

This majestic cruiser is a U. S. Navy airship. Its mission is locating trouble—*ahead of time*. How effective its deadly purpose in convoy is attested by the fact that "no vessel escorted by a blimp in World War II was sunk by an enemy submarine." Its invaluable contribution to our Aircraft Early Warning system is also firmly established. It is a Navy "tool" that virtually eliminates surprise.

The U. S. Drill Head Co.'s new electronic device seeks trouble too—in automated production lines. It locates faulty machining during a "transfer setup" and stops the machine *before* succeeding operations are begun. It minimizes the chance of costly smash-ups and resulting expensive down-time . . . reduces re-operating and scrap-loss costs.

This development is another precision cost-reducing "tool" from the largest exclusive drill head builder in the world.

We manufacture all types of adjustable, fixed center and individual lead screw tapping heads. Ask us to help solve your multiple drilling and tapping problems.



US Individual Lead Screw Tapping Head automatically signals on a light panel exact location of any spindle not tapping to full depth, and stops the entire line. In addition, patented US Safety Tap Spindles prevent all tap breakage due to dull taps or improperly drilled holes. Installed on transfer machines, this exclusive US development provides dual automatic protection during tapping without need for an extra probing station.

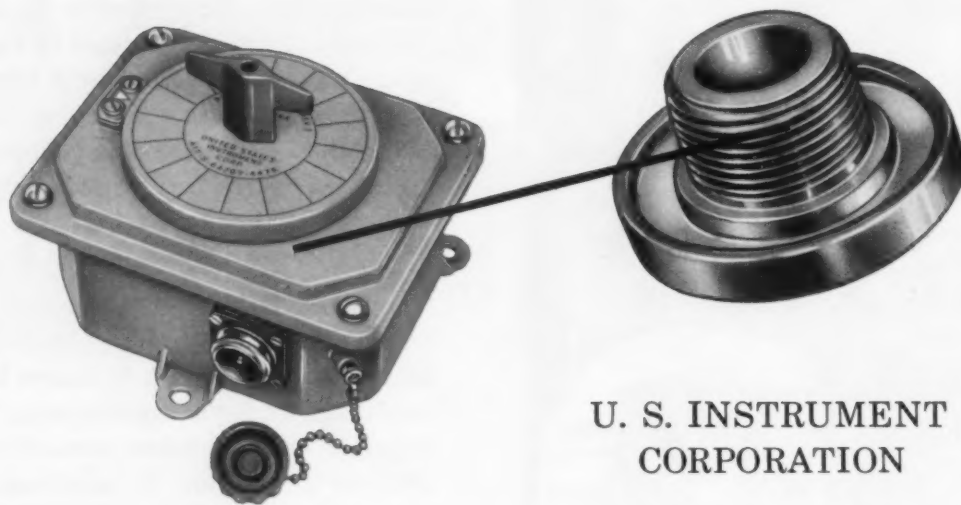


UNITED STATES DRILL HEAD CO.

BURNS STREET • CINCINNATI 4, OHIO

# Three more nationally known manufacturers select Mueller Brass Co. Forgeable Bearing Alloys for vital components of their products

In ever-increasing numbers, Mueller Brass Co. specialized alloys are being specified by manufacturers of top-quality products. In a series of continuing advertisements, we have presented case histories of successful applications, to which we now add three more distinguished companies who are incorporating Mueller Brass Co. forgeable bearing alloys in their products to meet the demands of widely divergent operating conditions.



## U. S. INSTRUMENT CORPORATION

U. S. Instrument Corporation, Charlottesville, Va., selected abrasive-resistant Mueller bronze alloy bushings for their remarkable telephone selector switches after exhaustive tests of many materials. A vital communications link on today's U. S. Naval vessels, these sound-powered telephone circuits must meet rigid Navy performance-standards. Such phones, for example, must have selector switches which are capable of rotating for a minimum of 50,000 torturous cycles . . . 360° clockwise, followed by 360° counter-clockwise. In addition, the "O" ring must still form a water-tight seal AT THE END OF THE TEST! Of the many tested, a Mueller Brass Co. special manganese bronze alloy was the best one meeting these rigid specifications.

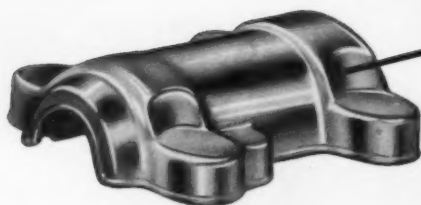
There were other important reasons why these bushings were chosen by U. S. Instrument Corporation for this

application. Resistance to abrasive action against the rubber "O" ring was a prime one . . . then, too, the stem assembly suffered severe pounding through the action of the indexing mechanism which, prior to the use of the Mueller Brass Co. alloy, caused repeated seizure of the component parts. In this particular application, the part was fabricated on an automatic screw machine rather than produced as a forging. The versatility of Mueller Brass Co. alloys makes them readily adaptable to the most economical method of fabrication dependent upon the size, shape, and end-use requirements of the part.

In commenting on the success of this part, U. S. Instrument Corporation praised the alloy for its tensile strength (ordinary brasses could not withstand the 2000 ft. lb. impacts without deformation), for its machinability and corrosion-resistance.

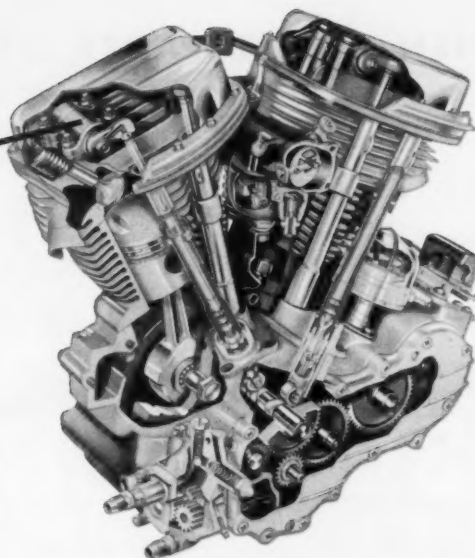


## MUELLER BRASS CO.



## HARLEY-DAVIDSON MOTOR CO.

Harley-Davidson motorcycles (made in Milwaukee, Wisconsin) have, since 1903, enjoyed a world famous reputation for economical, reliable transportation. These versatile machines are ideally suited for pleasure, for commercial or business use, as well as the grueling demands of law enforcement work. Harley-Davidsons boast a dependable engine . . . one which can roll up an astounding mileage record with little or no care. The painstaking selection of every engine component is one important reason for this reliability. The new twin-cylinder Harley-Davidson 74 OHV



employs Mueller Brass Co. bronze alloy forgings in the form of rocker-arm bearing caps. Subjected to violent temperature changes, fast starts and stops and road shock, Mueller forgings are proving again and again that they have the ability necessary to withstand almost any punishment . . . and still provide unfailing service.



## JACOBSEN MFG. CO.

Jacobsen Mfg. Co., Racine, Wisconsin, was among the first to produce a practical power mower for home use. That was more than 35 years ago! Today, Jacobsen power-mower dependability is evident itself in more than a dozen gleaming new models such as the popular Pacer, Lawn Queen, Manor and others. One of the most reliable components in the always dependable Jacobsen hi-torque engine is a Mueller Brass Co. connecting rod forged from special bronze alloy. Jacobsen mowers with Mueller-forged connecting rods are called upon by some commercial users to operate as much as 8 hours daily, 6 days a week . . . perhaps as much as 2000 hours a year. In searing summer temperatures, thru hours of constant operation, the high uniform strength of Mueller bronze forgings constantly withstands pounding and vibration with the same conspicuous success as in its many other applications.

Why not investigate these specialized alloys for your own products. We welcome your inquiries. Our engineering staff will be happy to make specific recommendations. Both on the proper alloy and the best method of fabrication to meet your needs . . . exactly. Our engineering manuals show many, many examples of how American manufacturers have used these alloys to great advantage.

### • WRITE TODAY FOR THE ENGINEERING MANUAL YOU NEED

- Mueller Brass Co. Forgings  
Engineering Manual H-58565 ☐
- Tuf Stuf Aluminum Bronze Alloys  
Engineering Manual H-58563 ☐
- "600" Series Bearing Alloys  
Engineering Manual FM-3000 ☐
- Copper Base Alloys in Rod Form  
Engineering Manual FM-3010 ☐



P O R T   H U R O N   2 7 ,   M I C H I G A N



WHEN SMALL PARTS GET

**SMALLER**

AND TOLERANCES GET

**CLOSER**

YOU NEED...

**BECHLER**  
SWISS AUTOMATICS



Bechler Model A-10—  
 $\frac{3}{8}$ " capacity.

When tolerances are too tight, and parts are too slender or intricate to be produced on ordinary screw machines, then Bechler genuine Swiss Automatics are probably what you need. Fifty years of experience have made Bechler the leading builders of Swiss type Automatics—and BECHLERS are SWISS-MADE.

Bechlers do the job quickly, accurately, uniformly, and with exceptionally high finish. Five tool slides, with single-point tools, can be individually adjusted with micrometer screws. The two horizontal slides of the double tool attachment are used for undercutting and burnishing. Different models are available with capacities up to  $1\frac{1}{4}$ " diameter and 9" turning length.

Get in touch with us soon. Find out how Bechler can help you make better products to meet and beat higher and higher standards.

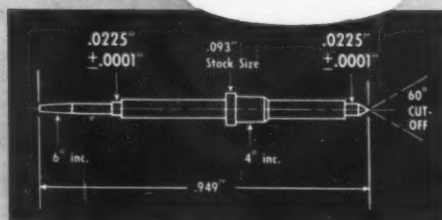
● Service centers in New York and Los Angeles—factory trained men will plan layouts, produce tools, cams, and make set-ups.

● Complete stock of attachments, spare parts, and cams.

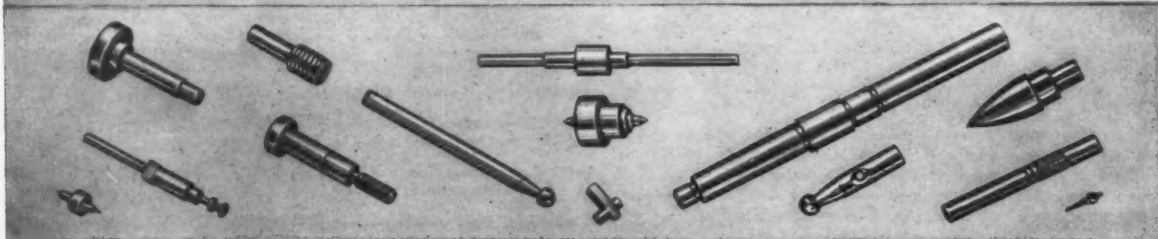
The Bechler Model A-10 can produce many different precision parts up to  $\frac{3}{8}$ " dia.,  $2\frac{3}{4}$ " long. Here are just a few, actual size:

**INDICATOR  
SHAFT**

Actual  
size



material	stainless steel, type 303
precision	bearing diameters held to $\pm .0001$ "
finish on bearing surfaces	6 MIRMS
production time	30 seconds per piece
machine	Bechler, Model A-10



**COSA**

—nationwide sales and service of precision machine tools—  
—from bench lathes to boring mills.

COSA CORPORATION, 405 LEXINGTON AVENUE, NEW YORK 17, N.Y.

IN CANADA contact Cosa Corporation of Canada Ltd., 1160 Lakeshore Road, Long Branch, Toronto 14, Ontario

**Progress in plan-it-yourself air systems:**

# You can use Schrader Air Products to produce faster at a lower cost

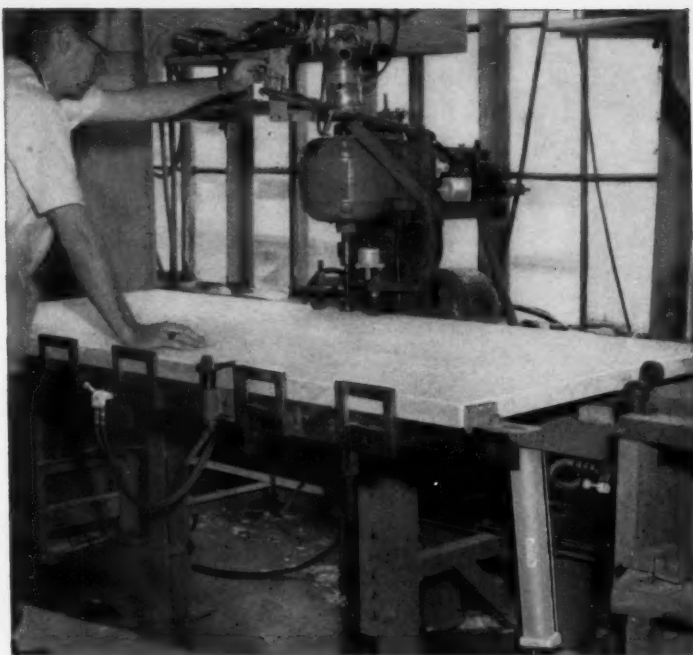
Air is a *natural* for many operations in processing, handling and other multi-step production . . . even to mortising doors in the woodworking field. Every day air's speed, simplicity and safety are effecting new production records.

## **Here's an example:**

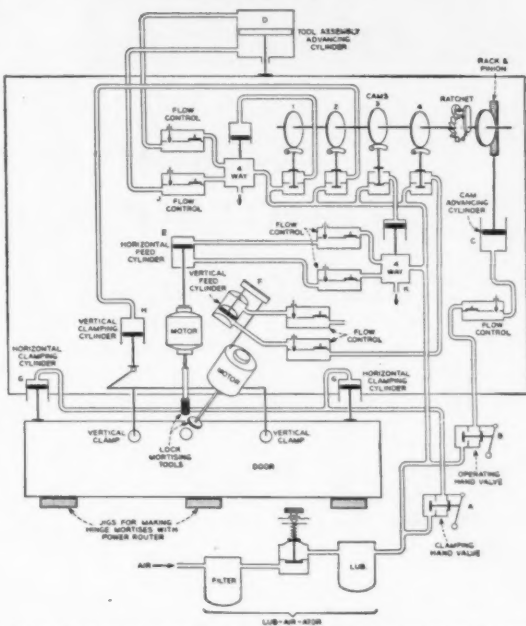
At a prominent Western woodworking company, Schrader Air Products are used on the door-mortising machine to clamp work in place, advance programming cam, and actuate all tool feeds. The machines work with extreme precision and the speed and economy of the operation are spectacular.

Chances are that Schrader Air Products can do the same for you no matter *what* you do. Take advantage of Schrader engineering facilities, available upon request, to assist you in planning for the best use of air in your production, and selection of the *right* Schrader Products to fit your needs.

Information is available by writing directly to us . . . and our Distributors are conveniently located for fast delivery.



A revolutionary building trend—pre-hung doors—means tremendous savings. Doors and frames are mortised for lock sets and hinges, assembled. This schematic shows how the door is prepared.



**Schrader**  
a division of **SCOVILL**

QUALITY AIR CONTROL PRODUCTS

**A. SCHRADER'S SON • Division of Scovill Mfg. Co., Inc.**  
462 Vanderbilt Avenue, Brooklyn 38, N. Y.

Please send latest informative booklets which show Schrader's complete line of products.

Name  Title

Company

Address



## AUTOMATIC BOLT MAKING AT NATIONAL SCREW AND MANUFACTURING CO.

The National Screw and Manufacturing Company, Cleveland, Ohio, one of America's oldest manufacturers of fasteners, relies on NATIONAL Boltmakers for fast, efficient bolt production.

The above photograph shows one battery of fifteen NATIONAL Boltmakers producing bolts ranging in size from 3/16" up to 1/2" in diameter at National Screw's Cleveland plant.

NATIONAL Boltmakers cut steel rod to proper length, extrude the blank, head,

trim the head, point the end and roll the threads, *all automatically!* Grain flow in the head and threads is symmetrical and unbroken. The part is stronger because the cold-forging action increases fatigue resistance and tensile strength.

You are cordially invited to visit our plant to investigate how NATIONAL hot- and cold-process machinery can bring you fast, automatic production of your forged metal fasteners and components. No obligation.

# NATIONAL

MACHINERY COMPANY

TIFFIN, OHIO—SINCE 1874

DESIGNERS AND BUILDERS OF MODERN FORGING MACHINES • MAXIPRESSES • REDUCEROLLS • COLD HEADERS • BOLTMAKERS • NUT FORMERS • TAPPERS • NAILMAKERS

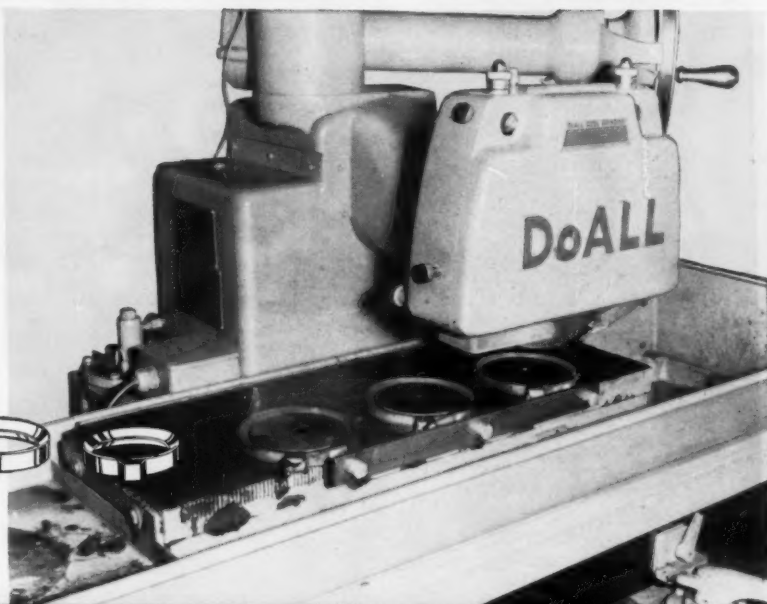
Hartford

Detroit

Chicago

# Can Your Surface Grinder Do This?

**Hold .0005"  
Accuracy and  
.0002" Parallelism  
in One pass  
over these 3½"  
diameter rings**



**The DoALL GRINDER Does IT EVERY TIME!**



Here's another "proof positive" success story for DoALL surface grinders! The Taber Instrument Corporation of North Tonawanda, N. Y., subcontracts the precision surfacing of helicopter rings which have to be held to "tenths."

Forged and heat-treated rings come to the Taber plant slightly warped, where the grinding operation not only has to provide flat parallel plane surfaces for subsequent machining operations but also bring the thickness to the desired finished size. Using an ingenious fixturing device, the operator surface grinds one side using 1/32" cross feed and a .005" deep cut. The other side of the rings are then ground to bring them to final size in one pass holding dimensional accuracy consistently to .0005" and parallelism to within .0002".

Let us show you how the DoALL grinder takes the guesswork out of your surface grinding. It has rigidity, reliance on hand wheel setting and "Cool Grinding."



**ASK FOR A FREE DEMONSTRATION** — Compare a DoALL with any surface grinder in your shop. See it in operation on a DoALL demonstration unit right in your own plant. Call your local DoALL Store or write.

**FREE MOVIES** — Sound and color to show you the ultimate in precision grinding. Call DoALL locally or write.

**FREE CATALOG** — Shows design and construction of DoALL Grinders and accessories including "Cool Grinding."



GR-21



**THIS IS A  
TYPICAL DoALL STORE**

## The DoALL Company, Des Plaines, Illinois

Visit our Booth No. 360—Metals Show, Chicago, November 4-8

**Band Saws**  
Machines and Blades

**Surface Grinders**

**Power Saws**

**DoALL SAW BANDS**

**MEASURING INSTRUMENTS**

**SHOP SUPPLIES**  
IN STOCK

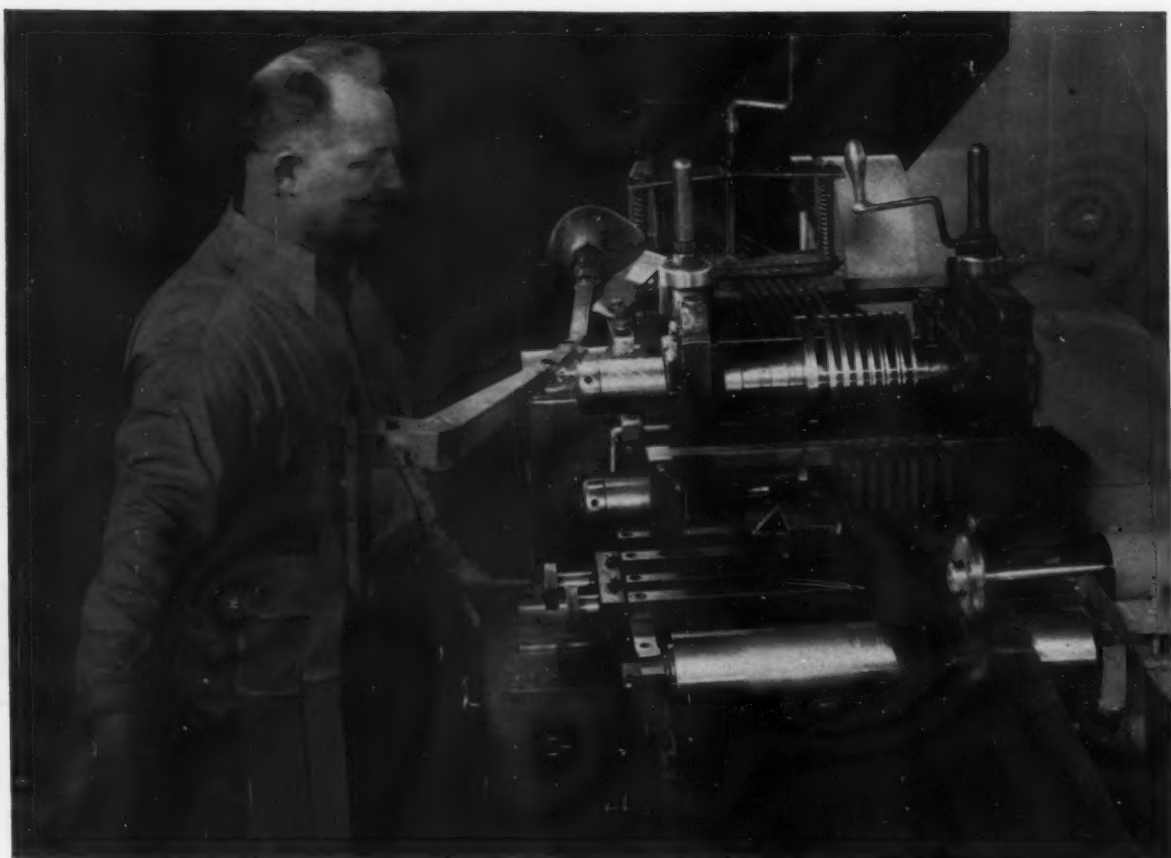
**Call Your DoALL Service-Store**

**MACHINE TOOLS ..... CUTTING TOOLS ..... INSTRUMENTS ..... IN STOCK**

For more information fill in page number on Inquiry Card, on page 237

MACHINERY, October, 1957—77





## Yoder Slitters Supply Varied Strip Widths for Tinnerman *Speed Nuts*<sup>®</sup>

Tinnerman Products, Inc., Cleveland, Ohio, produces more than 10,000 different shapes and sizes of "SPEED NUT" brand fasteners for industry... many of them to special specifications.

To do this, Tinnerman uses slit steel strands ranging in width from  $\frac{1}{8}$ " to  $7\frac{1}{2}$ ". To carry an inventory of the many strip widths required to meet normal and unusual demands would be almost impossible.

Tinnerman overcomes these inventory and supply problems by doing their own slitting on two Yoder slitters. This enables them to supply the plant with any strip size required from a relatively small inventory of 6" and 9" width purchased coils. In slitting narrow strands, such as these from small coils, a Yoder slitter may be profitable on a production as low as 25 tons per month.

Here is a fine example of how a small investment in Yoder slitting equipment greatly simplifies and speeds production while effecting important operating economies.

The saving made in time alone, reflects in better customer service through faster completion and delivery of finished products.

If your steel strip or sheet slitting requirements are as low as 100 tons per month or even less, a medium size Yoder slitter can be a very profitable investment for you. The Yoder line includes units of every size and capacity... of the most advanced engineering design. Send for the Yoder Slitter Book—a comprehensive text on the mechanics and economics of slitters and slitting line operation, with time studies, cost analyses and other valuable data. Write to:

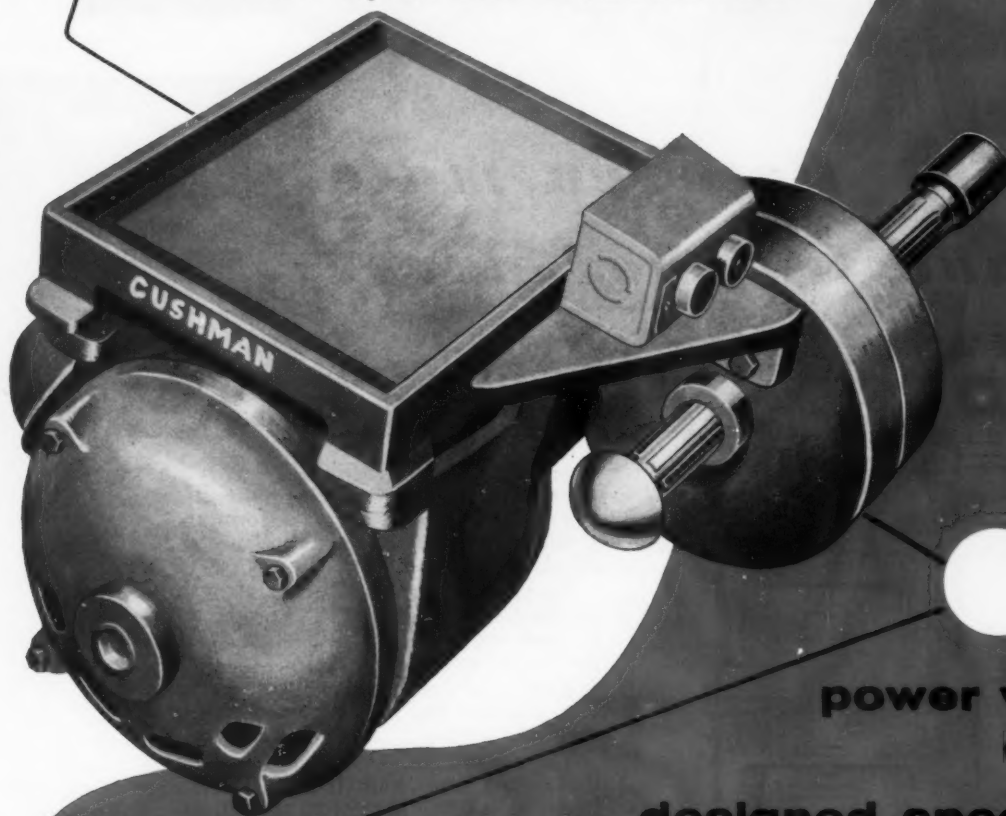
**THE YODER COMPANY • 5504 Walworth Ave., Cleveland 2, Ohio**



**ROTARY SLITTING LINES**  
**PIPE AND TUBE MILLS (ferrous or non-ferrous)**  
**COLD ROLL FORMING MACHINES**

# CUSHMAN POWER WRENCHES

speed production  
on single and  
multi-spindle machines



power wrench  
chucks

designed specifically  
for use with  
power wrenches

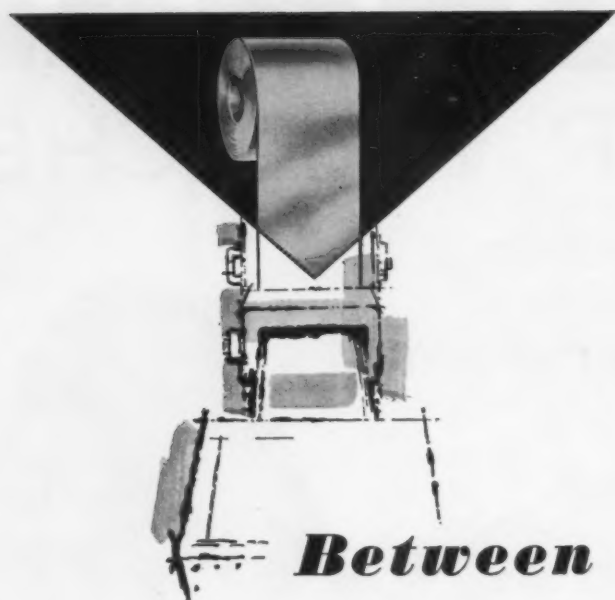
**CUSHMAN CHUCKS give CHUCK-ABILITY—**

The ability to SPEED your work ... ELIMINATE fatigue ... IMPROVE your products ... and REDUCE your costs ... through design and selection of the right workholding device.

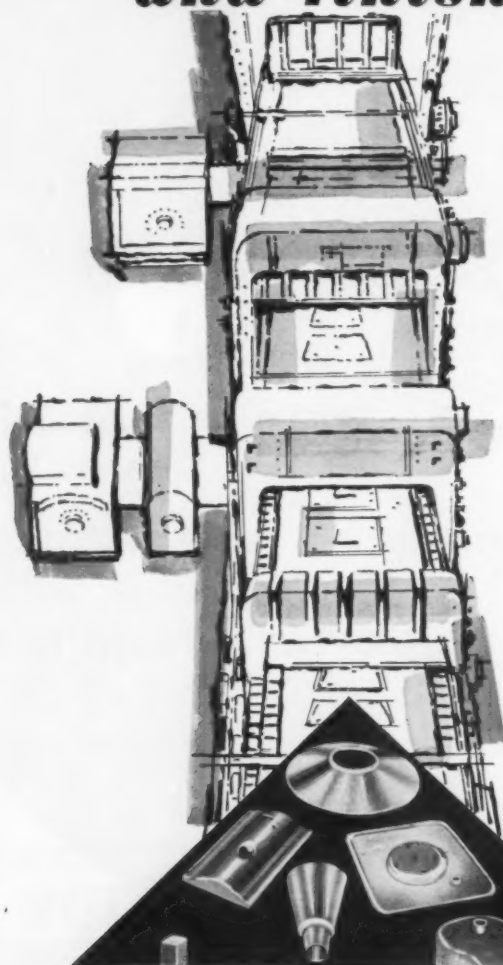


**CUSHMAN CHUCKS . . . a Product of**  
American Quality, Labor and Materials.  
Sold Through Your Industrial Distributor.

**THE CUSHMAN CHUCK COMPANY** Hartford 2, Connecticut



## ***Between material and finished part...***



### **AN IDEA THAT MAKES SENSE — A FEDERAL-WARCO PRODUCTION LINE**

Between material and finished part is the ever present problem of bringing together the machinery necessary to perform all production operations as speedily and efficiently as possible.

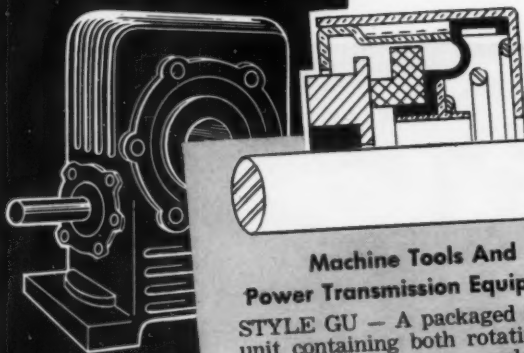
It's here, the Federal-Warco, this packaged production line has proved to be the answer for many of the nation's foremost production experts.

Simply provide Federal-Warco engineers with material and part information and they will develop a line to do the job.

The advantages: One source responsibility that means faster, more thorough service; a line that is 100% harmonic, all stations developed especially to work in synchronization; integrated and automated handling of work in process; the possibility of utilizing common drives and bases, reducing operating costs and saving valuable floor space.

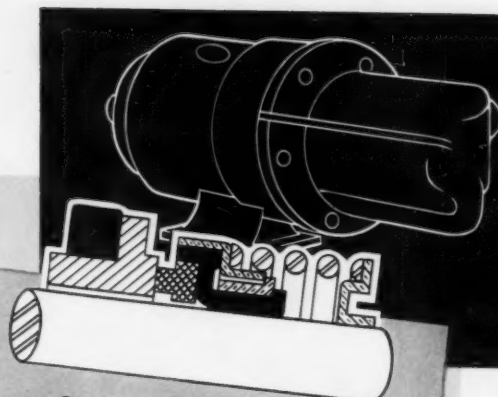
There is much more. Why not look into this modern method of production line manufacture? Talk to your Federal-Warco representative. Offices in all leading industrial areas.

**Federal / Warco**  
PACKAGED  
PRODUCTION LINES



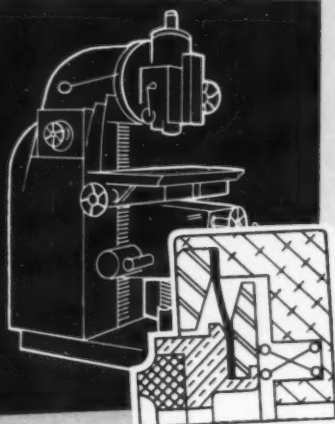
#### Machine Tools And Power Transmission Equipment

**STYLE GU** — A packaged sealing unit containing both rotating and stationary seal faces enclosed in metal housing. Stock sizes for shafts .250 through 4.000.



#### Pumps And Compressors

**ROTO-FLEX** — Rugged flexibility. Only 3 parts. Single or double units. Stock sizes for shafts .250 through 4.000.  
**STYLE RFO** — A specially designed Roto-flex seal, for installation outside the stuffing box. Stock sizes for shafts .250 through 4.000.



#### Heavy Machine Tools

**STYLE DPC** — A high-speed, carbon-faced seal, for more compact installation in heavy industrial machinery. Stock sizes for shafts .250 through 4.000.

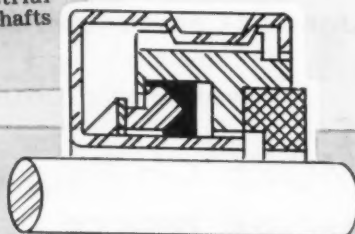
## A Complete Line **GITS SHAFT SEALS** For Every Application

These modern, mechanical, face-type seals are carried in stock — to save you time and money. Write for detailed data.

### **GITS BROS. MFG. CO.**

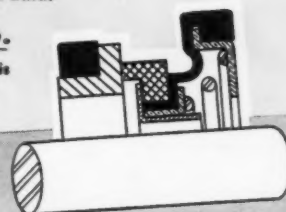
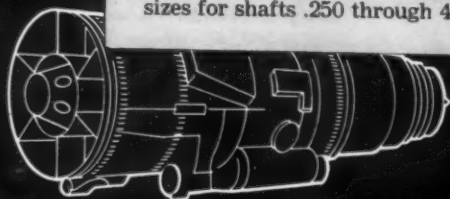
1858 South Kilbourn Avenue • Chicago 23, Illinois

Specialists In Lubricating Devices And  
Shaft Seals For Almost Half-A-Century



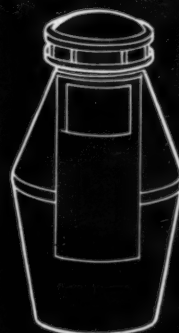
#### Aircraft Engines And Accessories

**STYLE HH** — Absolute minimal space (both radial and axial) under extreme conditions of temperature, pressure and seal face surface speed. Features pressure balance when fluid pressure is applied internally or externally. Stock sizes for shafts .250 through 4.000.

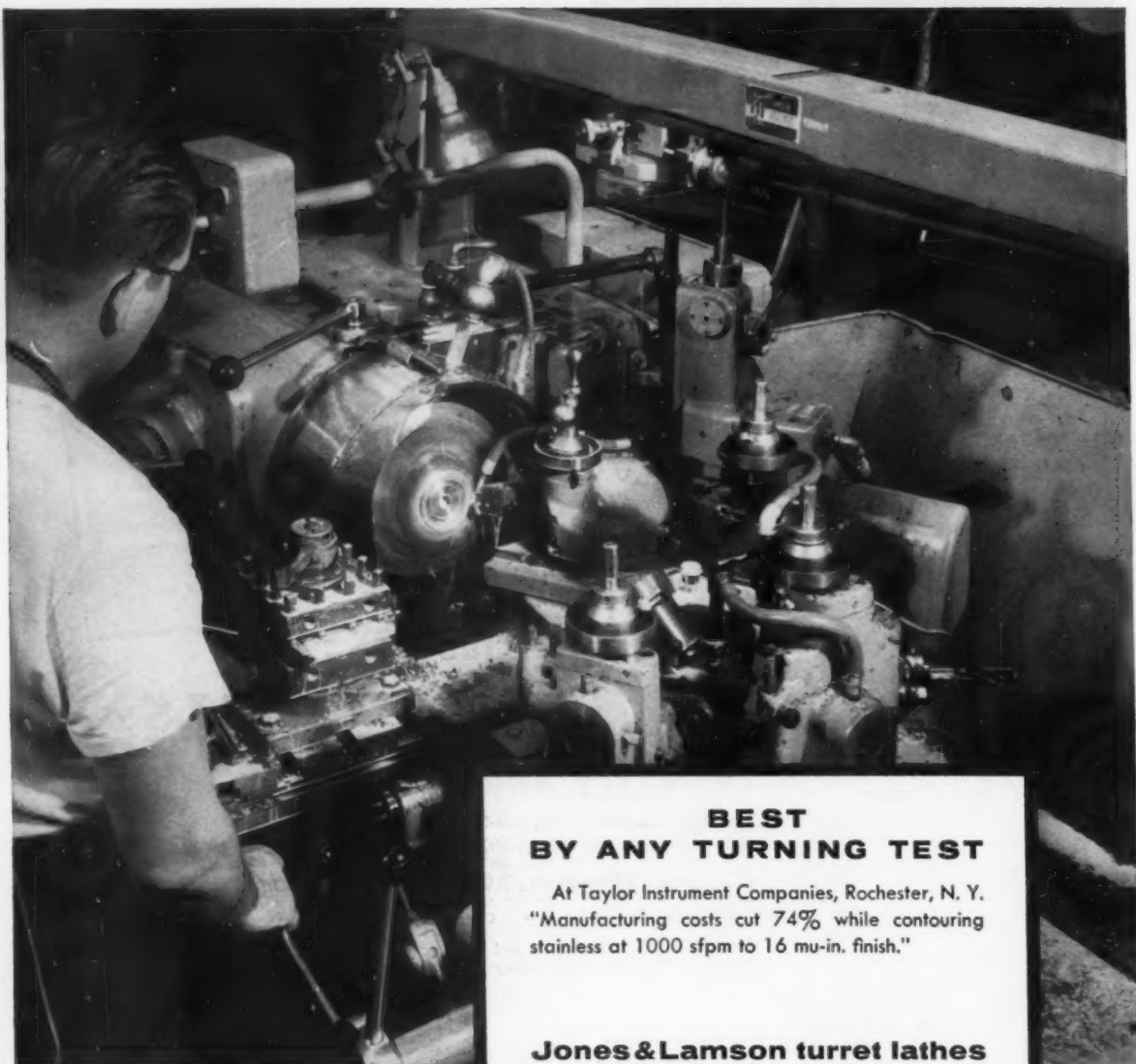


#### Household Appliances

**STYLE SGU** — A factory-assembled unit-type seal for the small-budget user. Stock sizes for shafts .250 through 1.000.







**BEST  
BY ANY TURNING TEST**

At Taylor Instrument Companies, Rochester, N. Y.  
"Manufacturing costs cut 74% while contouring  
stainless at 1000 sfpm to 16 mu-in. finish."

**Jones & Lamson turret lathes  
are built and  
powered to produce...**

**MORE CHIPS per tool  
MORE PIECES per hour  
MORE PROFIT per job**  
*than any other turret lathe of comparable size!*

*Write Jones & Lamson for details*

# JONES & LAMSON

JONES & LAMSON MACHINE COMPANY, 512 Clinton St., Springfield, Vt., U.S.A.

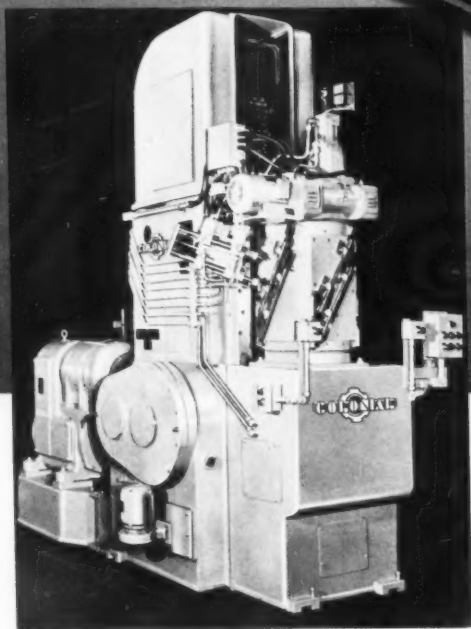
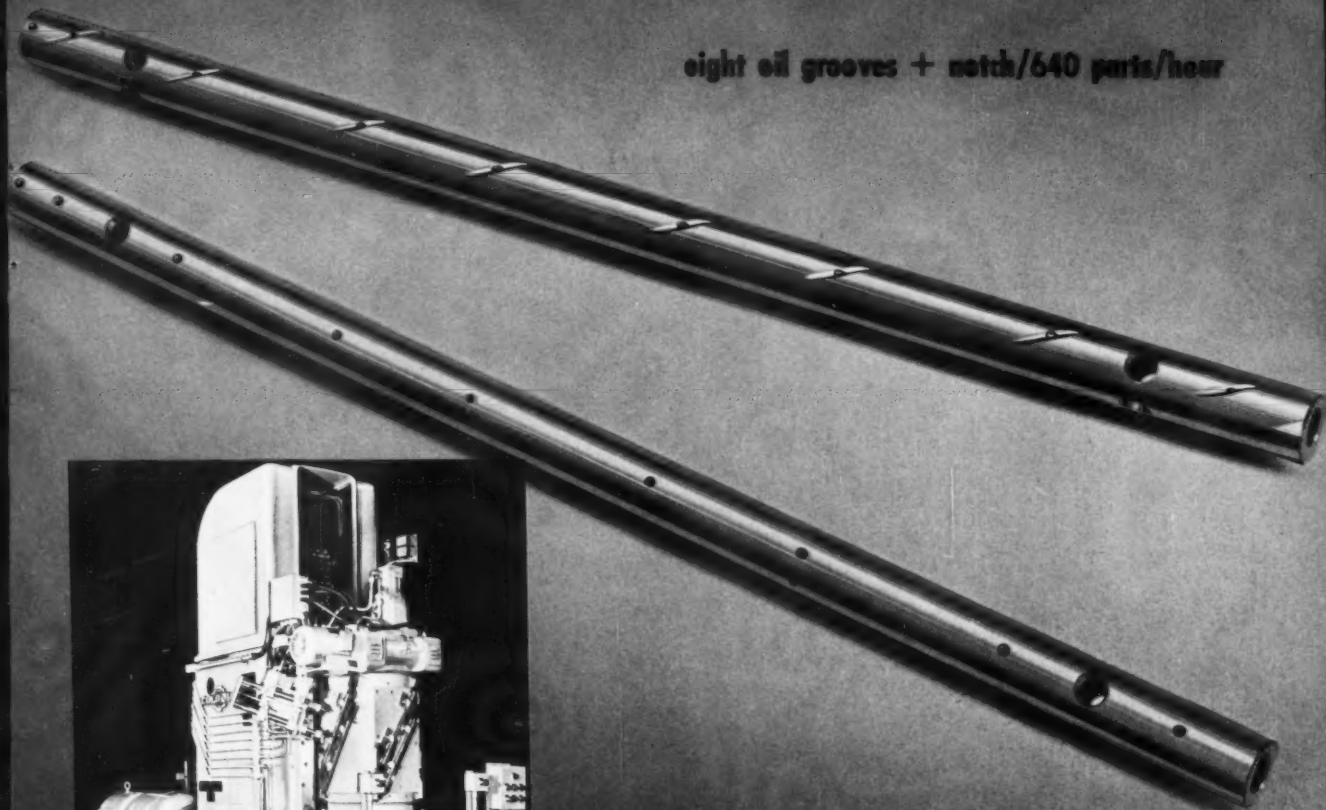


the man who needs a new machine tool  
is already paying for it

**MACHINE TOOL DIV.**

**WITH  
COLONIALS**  
the final cost  
is less!

eight oil grooves + notch/640 parts/hour



## "No Return" Broaching Does This on 1 Machine

This vertical chain surface-broaching machine and a 4-station fixture were selected by **COLONIAL** engineers for the **UNIFIED BROACHING** installation that cuts eight oil-groove slots and one identification notch in a rocker-arm shaft. Two parts are loaded, automatically probed for true position, broached, and automatically ejected in a cycle time of 9 seconds. Broaching is in one pass at 35 sfpm. The grooves are angularly cut at 30° to a radial depth of 0.06 inches. Parts unloading is by air ejection. The machine is a 10-ton, 160-in. stroke model. Profit-building applications like this are covered regularly in **BROACHING NEWS**. If you're not getting your copy, write today.

**COLONIAL'S** one-way surface-broaching machine has an amazing output capacity. There is no time out for broach return. It has nearly twice the effective broach length (or stroke) as any other machine of the same height. Actually, the machine shown at the left has a 160-in. stroke although less than 12 feet high. Obviously, metal-removal capacity is practically doubled. For full details, write for Bulletin VCA.



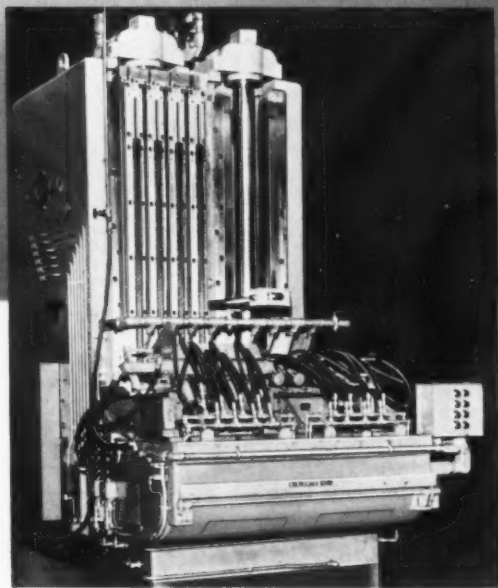
**WITH  
COLONIALS**  
the final cost  
is less!

480/hr



## You Can Broach 8 Parts Like This in 1 Minute

Machining 8 thin-walled lugs on the face of a nozzle plate isn't the easiest of metalworking jobs. The part is complex; the production rate, high; the tolerances, close; and the quality must be distortion free. It is done by broaching 8 parts in 2 strokes in 2 indexing fixtures on one **COLONIAL** Dual-Ram. For jobs like these, broaching, and particularly broaching with **COLONIALS**, is the best answer. Let us prove it to you. Send us your prints and production requirements.



This is the **COLONIAL** Dual-Ram 15-ton 66-inch stroke surface broaching machine that broaches the part. Automatic chip facilities handle the heavy metal removal (2.8 lbs. per min. of one machine cycle). Usually you can load while one ram cuts and the other is returning. You can use the two rams for different operations on the same part, or for broaching different parts. Dual-Rams are available in 6, 10, 15 and 25-ton capacities with strokes of 42, 48, 54, 66 and 90 inches. Write for Bulletin RT.

**COLONIAL**  
BROACH & MACHINE CO.  
DETROIT 13, MICH.

how the **KOEHRING COMPANY**  
reduces their cost savings  
opportunities to careful analysis

**CAPITAL EQUIPMENT REPLACEMENT ANALYSIS**

PLANT ROCKFORD METALWORKS DATE 8-20-55  
 Subject of Analysis Replace Machine No. 22 & 32 with one new 36"

2. Annual Rate of Production 7020 hours.

PRESENT EQUIPMENT		PROPOSED EQUIPMENT	
3. Description <u>(1) 24" &amp; (1) 42"</u>		7. Description <u>(1) 36"</u>	
4a. Tool No. <u>32 &amp; 22</u> Location <u>Dept. 2</u>		8. Total Installed Cost <u>\$49,989</u>	
4b. Age in years <u>33 yrs.</u> Installed Cost <u></u>		9. Estimated Primary Service Life <u>18 years</u>	
4c. Salvage value <u>1800</u> Scraped <u>Scrap</u>			

ITEMS	ANNUAL AVERAGE OPERATING COMPARISON			
	OVERALL Savings	VS PRESENT Equip'l. Costs	PROPOSED Savings	VS PRESENT Equip'l. Costs
10. Increased Output	\$	\$	\$ 3,884	\$
11. Direct Labor			4,960	
12. Indirect Labor				
13. Fringe benefits			1,011	
14. Normal maintenance			150	
15. Setup Costs				
16. Tool Costs			780	
17. Scrap & Rework			250	
18. Downtime				
19. Power Consumption				73
20. Subcontract Costs			2,750	
21. Property Tax & Insurance				1200
22. Floor Space at \$10 Sq. Ft.			.375	
23. Other items				
24. Total	\$	\$	\$13,640	\$ 1273
25. Annual Gross Savings	\$	\$	\$12,367	

CAPITAL COST SAVINGS		SUMMARY	
26. Useful life after overhaul		26. Cost of equipment (from line 8)	\$ 49,989
27. Cost of major overhaul	\$	27. Cost of breaking in new equipment	
28. Handling costs		28. Other expended cost	
29. Cost of breaking in equipment		29. Total cost of replacement	49,989
30. Other expended cost		30. Subtract salvage value of old equipment (from line 4c)	1,800
31. Net cost of overhaul	\$	31. Net cost of replacement	\$ 48,189
32. Annual gross savings (from line 25)	\$	32. Annual gross savings (from line 25)	\$ 12,367
33. Annual savings required to give desired return for useful life (from line 24)	\$	33. Annual savings required to give desired return for useful life (from line 24)	9,200
34. Annual net savings	\$	34. Annual net savings (from line 32)	\$ 3,167

ALTERNATIVE SELECTED

Calculated by B. G. MCKINLEY Date October 8, 1955  
 Approved by \_\_\_\_\_ Date \_\_\_\_\_  
 Approved by \_\_\_\_\_ Date \_\_\_\_\_

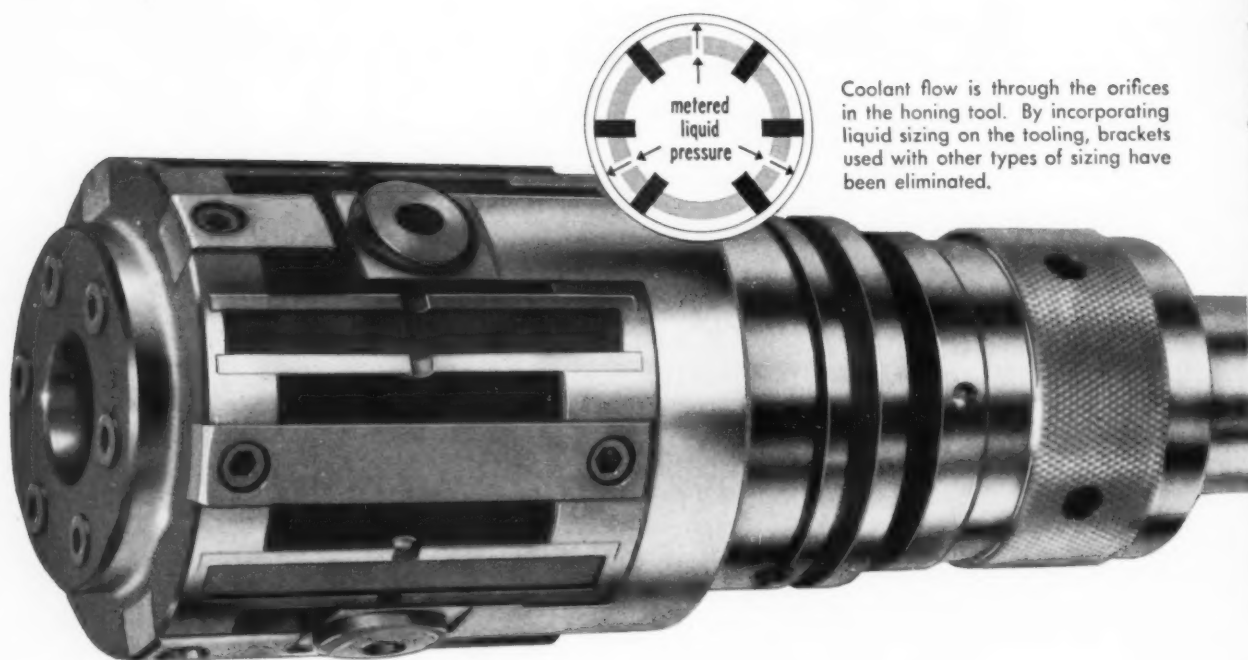
\* **GAIN** from replacement by the Koehring formula is . . .  
 . . . after required interest or return on the new investment  
 . . . after full allowance (by the formula) for future obsolescence of the new equipment.

**ROCKFORD  
INSERT  
GROUP**

*Keep gathering metal-  
working production ideas . . .  
be well informed when you  
replace machinery . . . . .*



## new liquid sizing



Coolant flow is through the orifices in the honing tool. By incorporating liquid sizing on the tooling, brackets used with other types of sizing have been eliminated.

**CUSTOM-HONING SERVICE** for special short-run applications. Send us your short-run pieces, with specifications and requirements for prompt honing by expert technicians.



Machinery, October, 1957

**MACHINES DESIGNED TO MEET YOUR NEEDS ROCKFORD, ILLINOIS, U.S.A.**

### **automatically gauges full length of honed bores**

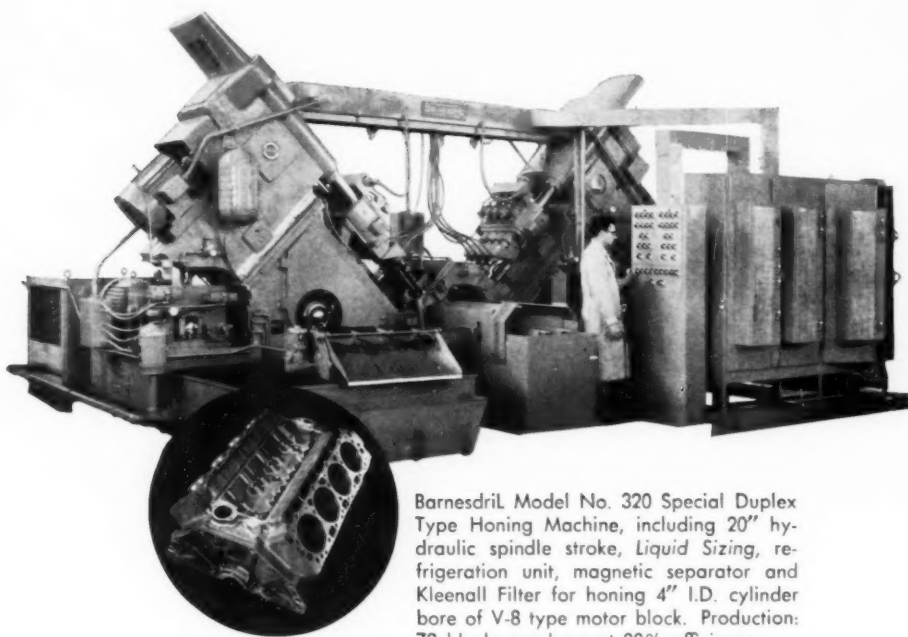
Barnesdril honing engineers have developed an improved method for sizing honed bores, as a part of the honing machine cycle. Referred to as Liquid Sizing, this method automatically gauges the diameter of honed bores throughout their full length as honing progresses.

Sizing is accomplished by metering liquid pressure, directed against the cylinder wall through orifices in the honing tool. As honing progresses, the bore increases in size, causing the pressure to decrease. When the pre-selected bore size is indicated over full length of honed bore by the balanced pressure, a limit switch terminates the honing machine cycle, permitting the tool to complete the stroke and withdraw from the bore.

This new Barnesdril Liquid Sizing method offers the following advantages:

1. Sizing the entire length of bore.
2. Better heat control as a result of directing the flow of coolant through the honing tool orifices to the most critical point.
3. Continual stone flushing, giving longer stone life and better micro finish control.
4. New Barnesdril Plate Type Honing Tools are utilized.

Contact your Barnesdril representative for full details on new Liquid Sizing, or write us directly. Years of engineering experience dealing with honing problems enable Barnesdril engineers to supply the most practical methods and equipment to solve your hole finishing problems.



Barnesdril Model No. 320 Special Duplex Type Honing Machine, including 20" hydraulic spindle stroke, Liquid Sizing, refrigeration unit, magnetic separator and Kleenall Filter for honing 4" I.D. cylinder bore of V-8 type motor block. Production: 72 blocks per hour at 80% efficiency.



th year

### **BARNES DRILL CO.**

820 CHESTNUT STREET • ROCKFORD, ILLINOIS  
DETROIT OFFICE: 3419 South Telegraph Road

Machinery, October, 1957

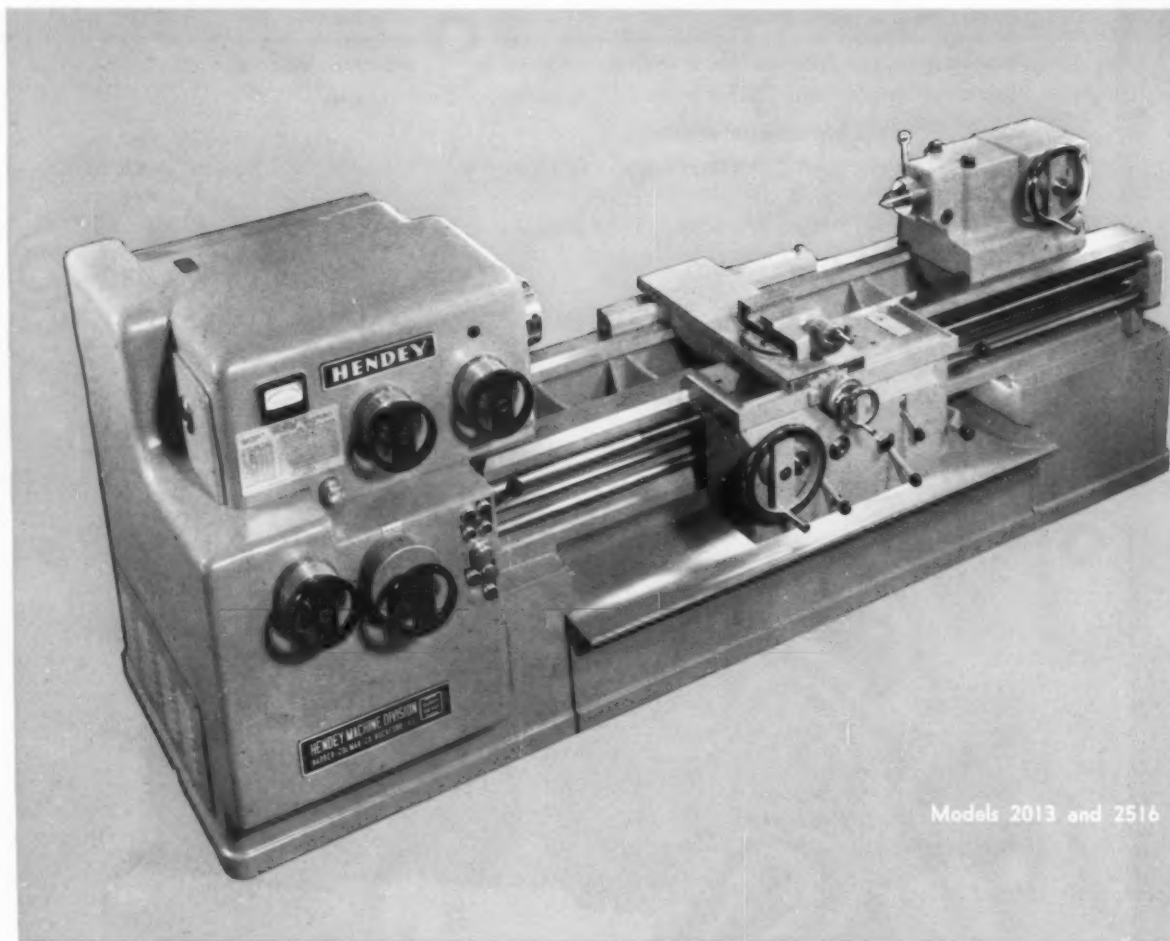
CITY OF MACHINE-TOOL SPECIALISTS

**ROCKFORD, ILLINOIS, U.S.A.**



**NOW! FROM HENDEY...**

**all new 32-speed**



Models 2013 and 2516

*More rigidity, more threading features, more lathe per dollar!*



Machinery, October, 1937

MACHINES DESIGNED TO MEET YOUR NEEDS **ROCKFORD, ILLINOIS, U.S.A.**

# geared-head lathe

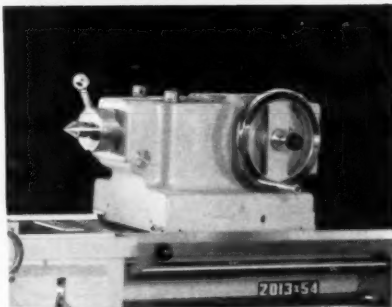
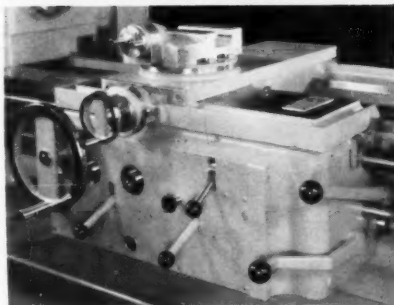
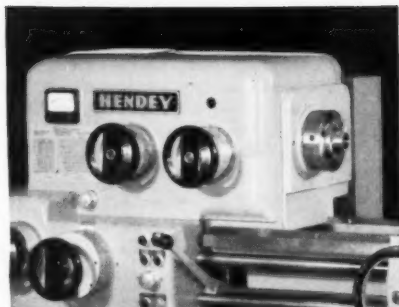
Here are the all-new Hendey No. 2013 and No. 2516 lathes, with a 32-speed geared head (up to 2000 rpm), a complete line-up of threading features, and heavy-duty design combined with toolroom precision. The 32-speed headstock transmission contains crowned, flame-hardened spur gears which are automatically lubricated. You select speeds simply by shifting gears. Greatly simplified mechanical design gives you lower maintenance costs — more machine, dollar for dollar, than any other lathe in its class.

Three sets of super-precision tapered roller bearings support the spindle at both ends and in the middle, increasing accuracy and improving finish. An automatic spindle adjuster eliminates any manual adjustment of the spindle bearings regardless of the spindle speed.

The extra-heavy bed casting is made of dense, wear-resistant semi-steel, which is induction-hardened and ground on all way surfaces. Lathes can be furnished with a 15, 20, or 25 hp spindle drive motor and come equipped with a load meter and automatic overload release for the carriage feed.

Hendey has all the threading features, including: (1) multiple-thread indexing spindle, (2) built-in thread-chasing dial, (3) 66 feed and thread changes, with 2 to 120 quick-change threads per inch and feed range from .0015 in. to .091 in. per revolution, (4) reverse lever on apron, (5) automatic micrometer stops, (6) ball-thread-chasing stop on cross-feed screw, (7) hardened and precision-ground cross-feed screw and compound screw, (8) automatic, filtered lubrication to the half nuts.

Compare these tailstock features with other lathes on the market: Weighing almost 400 lb, the tailstock can be positioned quickly and easily with one hand. And the ways under it are hardened and ground. Large  $4\frac{1}{2}$  in. diameter spindle has a full 10 in. extension, with slow and rapid traverse speeds.



*Hendey* machine division  
BARBER-COLMAN COMPANY  
102 Loomis St., Rockford, Illinois



Machinery, October, 1957

FOR PRODUCTION MACHINE TOOLS IT'S

**ROCKFORD, ILLINOIS, U.S.A.**





# "Engineered Production" Service

FOR BROACHING



# It takes

# all 3

**American's "Engineered Production" Service** ... gives the broach-user the complete three-part service that is essential to obtain the most practical broaching method. Years of design and production engineering experience, unavailable at any price, are effectively added to your staff at no extra cost.

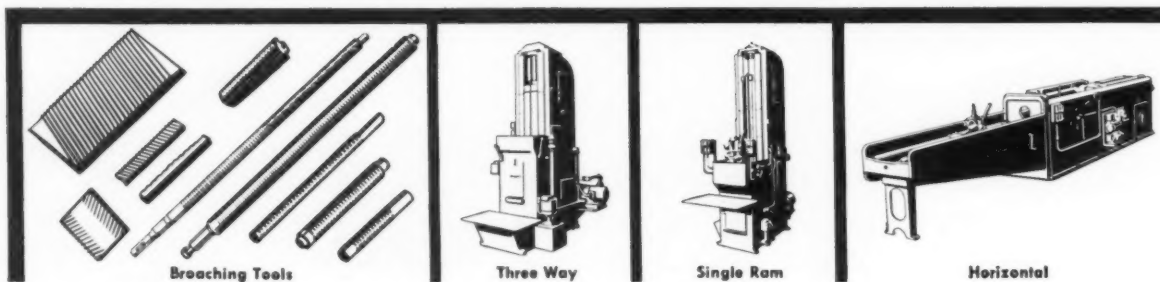
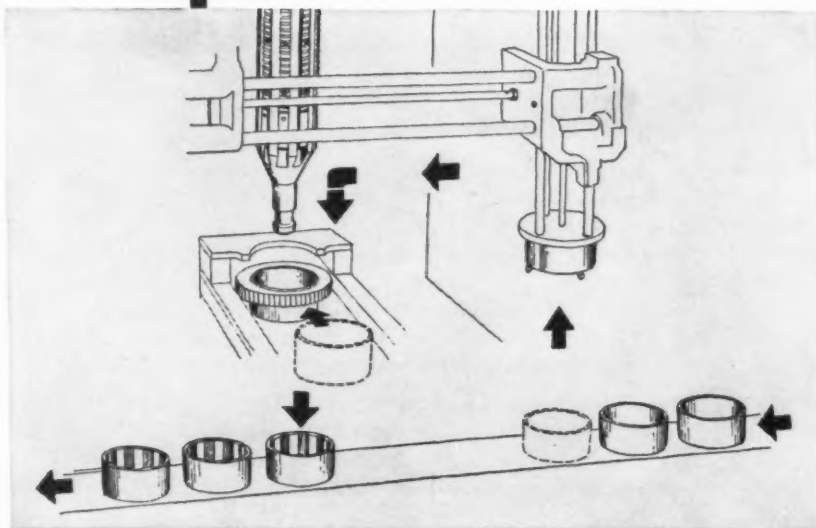
**THE JOB**—Broaching ten 1.042 — 1.0435 wide internal splines in an automotive brake drum in a single pass.

**THE RESULT**—Fully automatic cycle produces 125 parts per hour on vertical hydraulic internal pull-down machine.

# 1

## PROPER BROACH TOOL DESIGN

Top-quality results on any broaching operation require starting the job with design of the broaching tool itself. In solving this all-important first step, American Broach considers stock removal, length and width of cut, finish tolerances required, etc. High-quality work and long tool life result because broach and machine are designed to operate as a team. For maximum economy on this job, the broach tool is made up of ten sectional surface broach assemblies mounted on an arbor. Maximum user benefit is obtained by easy removal for sharpening and replacement.



Machinery, October, 1957

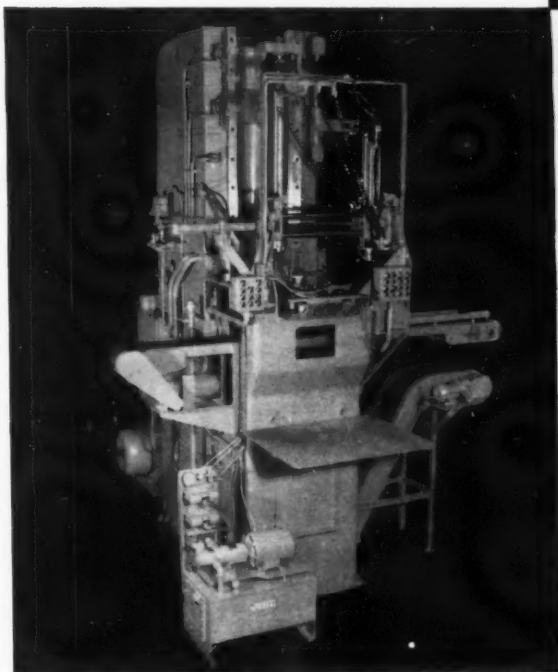
CENTER OF MACHINE-TOOL EXCELLENCE

**ROCKFORD, ILLINOIS, U.S.A.**

# to give you peak broaching performance

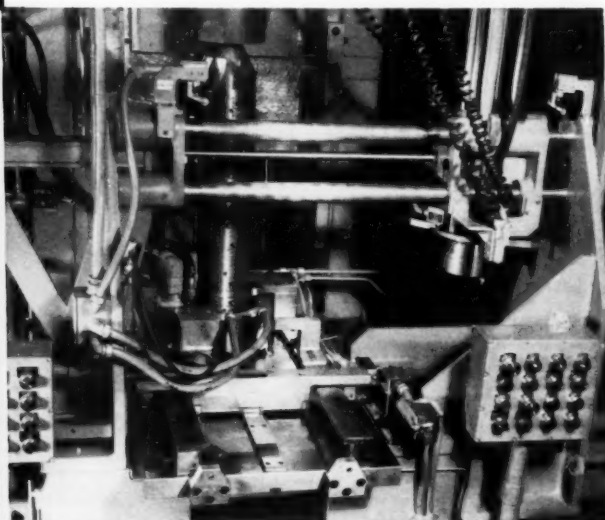
## 2 SPECIFYING THE RIGHT MACHINE

Production rate required, length and speed of stroke, relationship to other production machinery, available floor space, etc. determine the selection of the broaching machine capable of doing the best job. At American, machine selection follows design of the broaching tool. This vertical hydraulic internal pull-down machine has a full follow-up retriever mechanism and electrical controls. A swinging boom is used for loading and unloading the broach and an automatic chip conveyor unit is provided.

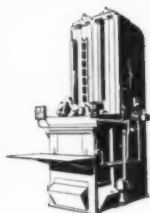


## 3 EFFICIENT FIXTURING

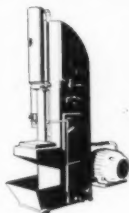
Whatever your parts geometry or hourly needs, fixturing by American Broach forms the vital third link in the production chain. In this installation, a hydraulically operated loading mechanism with an internal chuck picks up work from a conveyor and inserts it in a collet-type fixture for broaching. Finished work is automatically ejected to conveyor line. Because "skills" are built into the tool, machine, and fixtures, production schedules are maintained even with inexperienced operators.



More facts are available in American's Pull-Down Bulletin A619. Write for your free copy today.



Duplex Ram



Presses



*American*

**BROACH & MACHINE DIVISION**

SUNDSTRAND MACHINE TOOL COMPANY  
ROCKFORD, ILLINOIS

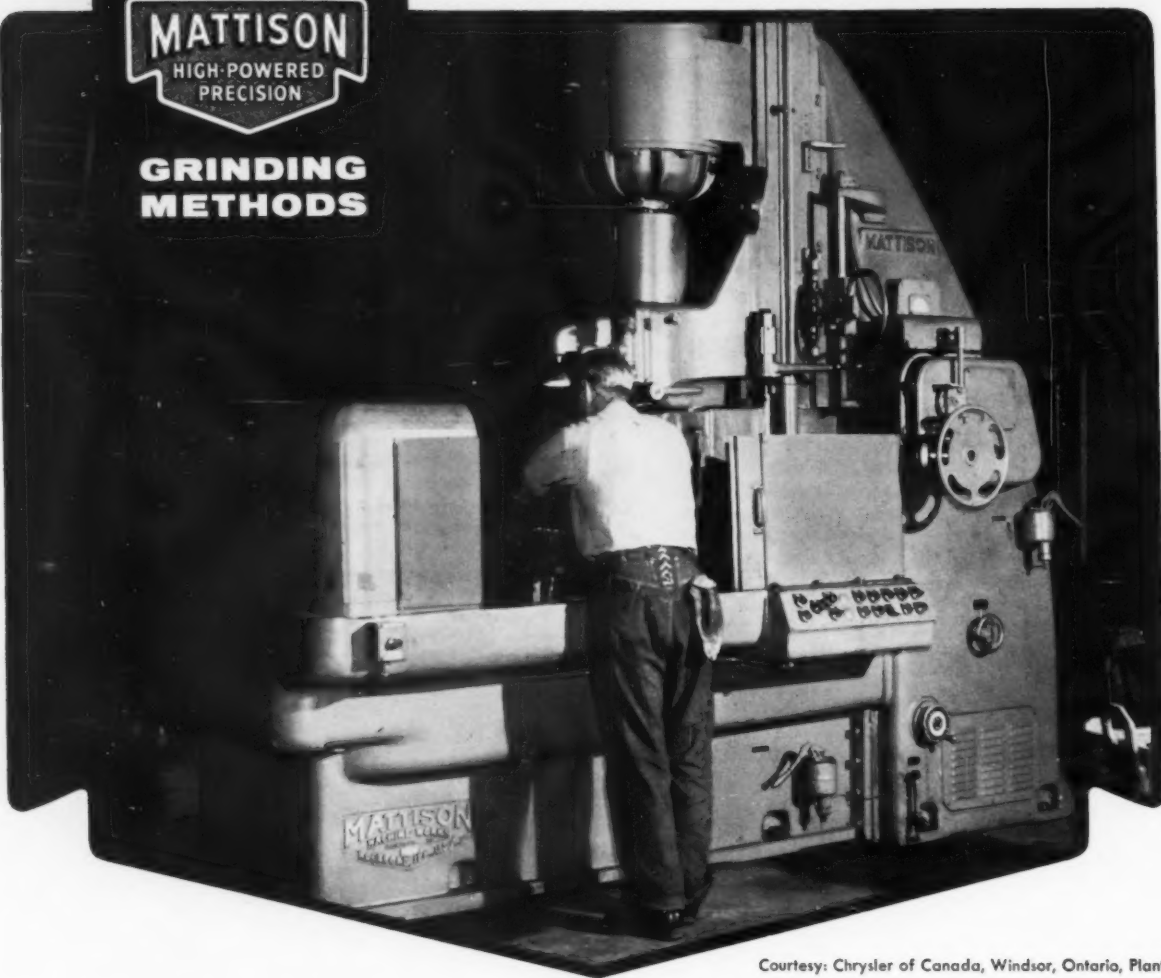
Machinery, October, 1957

FOR PRODUCTION MACHINE TOOLS IT'S **ROCKFORD, ILLINOIS, U.S.A.**





## GRINDING METHODS



Courtesy: Chrysler of Canada, Windsor, Ontario, Plant

### Three different surfaces on chain case covers ground at 13 per hour



In the Chrysler plant, the No. 36 removes up to  $\frac{1}{8}$  in. of stock while holding parallelism to .001 in. and accuracy to .002 in.

Power and rigidity of the Mattison No. 36 Vertical Rotary Surface Grinder pay off on this heavy stock-removal job at Chrysler of Canada's new Windsor, Ontario, motor plant. Three faces of heavy cast iron chain cases are ground in one setup . . . achieving a production rate of 13 cases per hour, each ground on three different surfaces.

The table passes the cases under the wheel at the rate of 30 rpm. Wheel speed is 900 rpm and downfeed is .060 in. per minute. Automatic size checks

each piece as it leaves the wheel and corrects feed accordingly.

Quality was one of the deciding factors in the selection of machinery for the new Chrysler plant. Like many other manufacturers, Chrysler has found the No. 36 Vertical Rotary's integral column-and-base construction, extra power, and exclusive functional design enable it to use modern, improved grinding wheels effectively . . . and profitably. For full details ask for Bulletin No. 146-4RM.

**IF IT'S A FLAT SURFACE  
THERE IS A MATTISON  
TO GRIND IT**

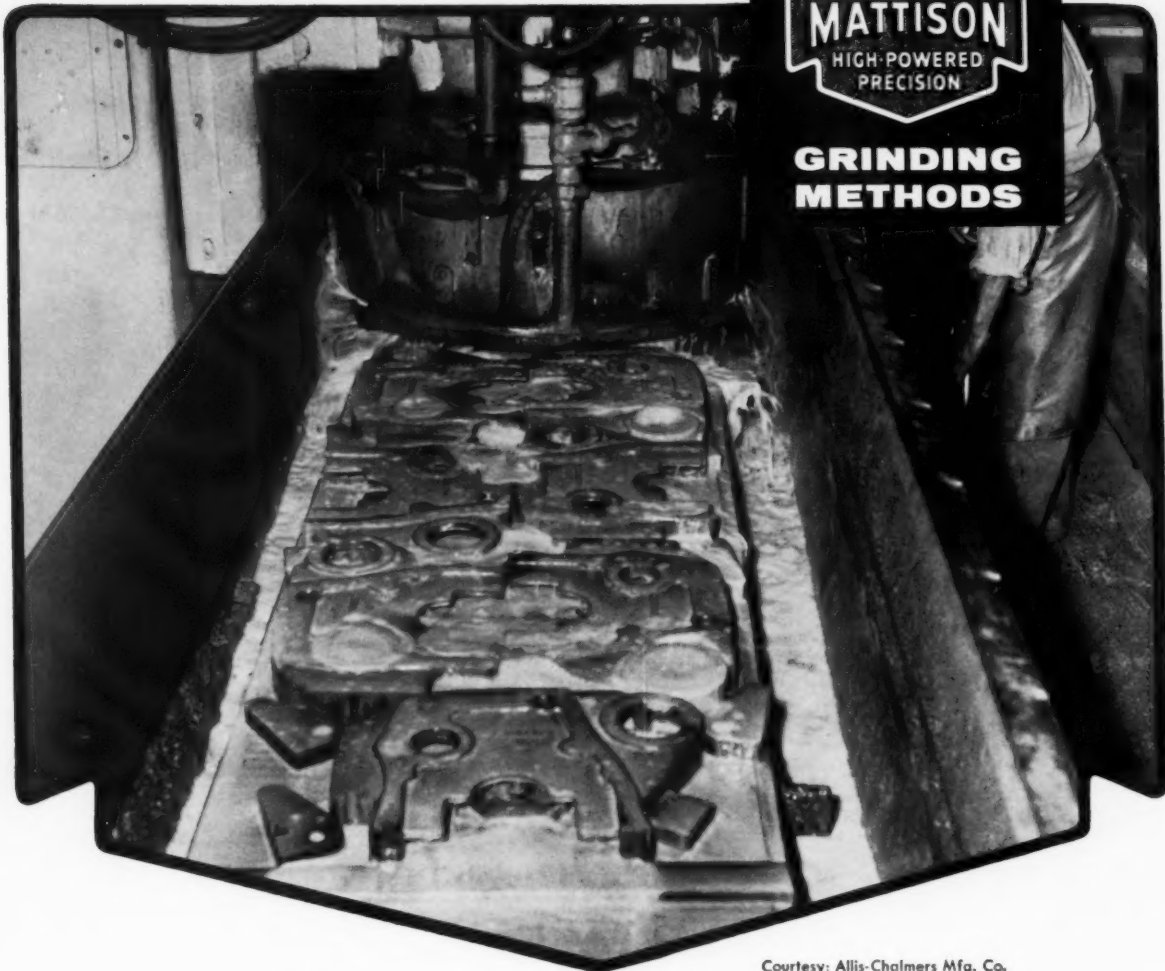


Machinery, October, 1957

CENTER OF MACHINE-TOOL EXCELLENCE

**ROCKFORD, ILLINOIS, U.S.A.**

**MATTISON**  
HIGH-POWERED  
PRECISION  
**GRINDING  
METHODS**



Courtesy: Allis-Chalmers Mfg. Co.

**Bigger loads, faster setup on surface grinder  
doubles production of parts formerly milled!**

Production was boosted from 5 to 12 parts per hour by switching this job to a Mattison No. "400-SS" Vertical Spindle Reciprocating Table Surface Grinder. The workpiece is a diesel engine timing gear housing that is first rough-ground to within .010 inch on both sides and then finish-ground on the same machine. Flatness and dimensional tolerances are easily maintained within commercial limits.

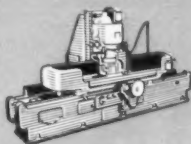
Practical elimination of setup time is a big item in getting this increased pro-

duction. Most parts have only to be laid flat on the magnetic table, fixtures are not needed in most cases. Seven castings, like those shown, can be finished at one time.

An extra-long and heavy column, rigidly fastened to the base, and a 60, 75, or 100 hp spindle motor are features which speed metal removal and increase accuracy on the Mattison 400 Series Vertical Spindle Surface Grinder. Arrange for a test grind on your parts in the Mattison Methods Laboratory.



Shaded portion of timing gear housings, at left, is removed in two-pass setup on Mattison 400-SS grinder. Finished workpieces are at right.



**HIGH-POWERED  
PRECISION  
SURFACE  
GRINDERS**

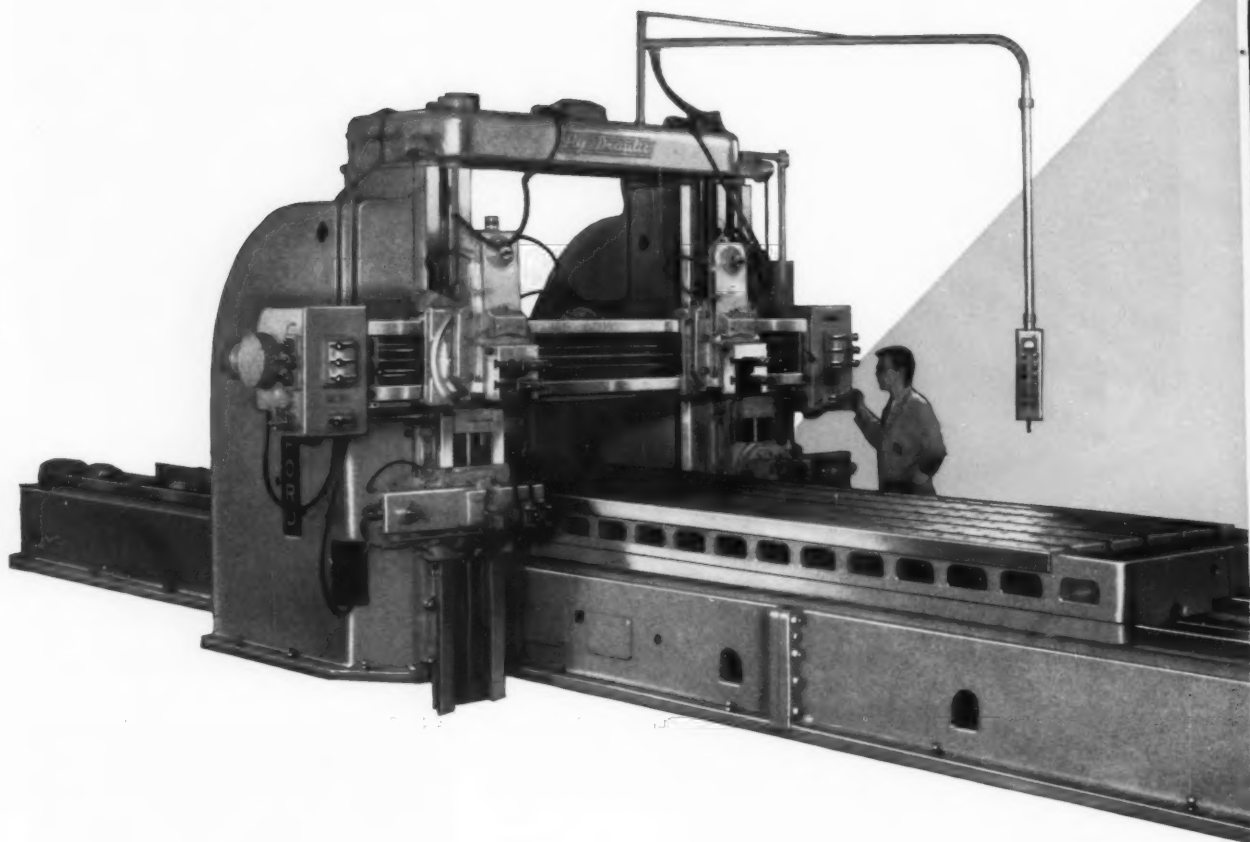
Machinery, October, 1957

FOR PRODUCTION MACHINE TOOLS IT'S **ROCKFORD, ILLINOIS, U.S.A.**





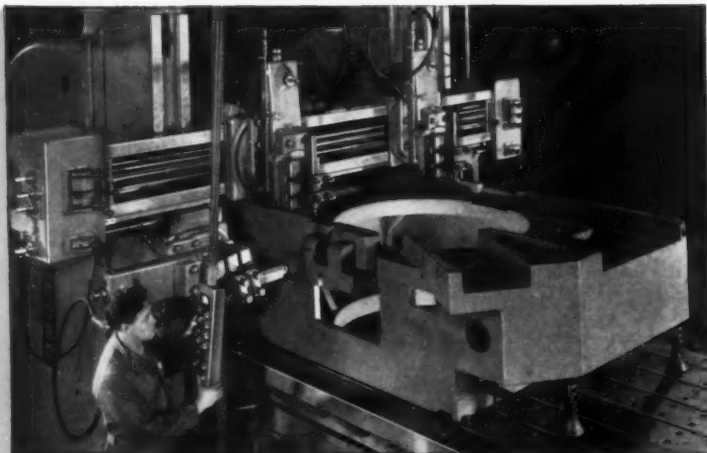
versatility of triple circuit **h3** drive



Machinery, October, 1957

CENTER OF MACHINE-TOOL EXCELLENCE **ROCKFORD, ILLINOIS, U.S.A.**

shown with 4-TON work piece!



MACHINED ON DOUBLE-HOUSING

## **ROCKFORD HYDRAULIC PLANER**

A Rockford Double-Housing Hydraulic Planer machines this huge casting, using carbide tools on 2 railheads and 1 sidehead. The exclusive hydraulic triple circuit supplies 3 cutting speed ranges for flexibility in changing from one kind of work to another. Pendant control offers selection of low range to 100 fpm., for extreme depths of cut and maximum feeds; medium range to 150 fpm., for average cuts in medium steel or cast-iron; or high range to 300 fpm., for carbide planing of steel and non-ferrous metals.

It is possible for an operator to adjust the h3 drive from 10 to 300 fpm. at the normal operating position, instantly selecting the speed range ideally suited for his individual job application.

See your Rockford Machine Tool Company representative for complete information on the versatility of the new hydraulic triple circuit h3 drive for your production work.



**h3  
drive**

**ROCKFORD MACHINE TOOL CO.**

2500 KISHWAUKEE STREET • ROCKFORD, ILLINOIS

Machinery, October, 1957

FOR PRODUCTION MACHINE TOOLS IT'S

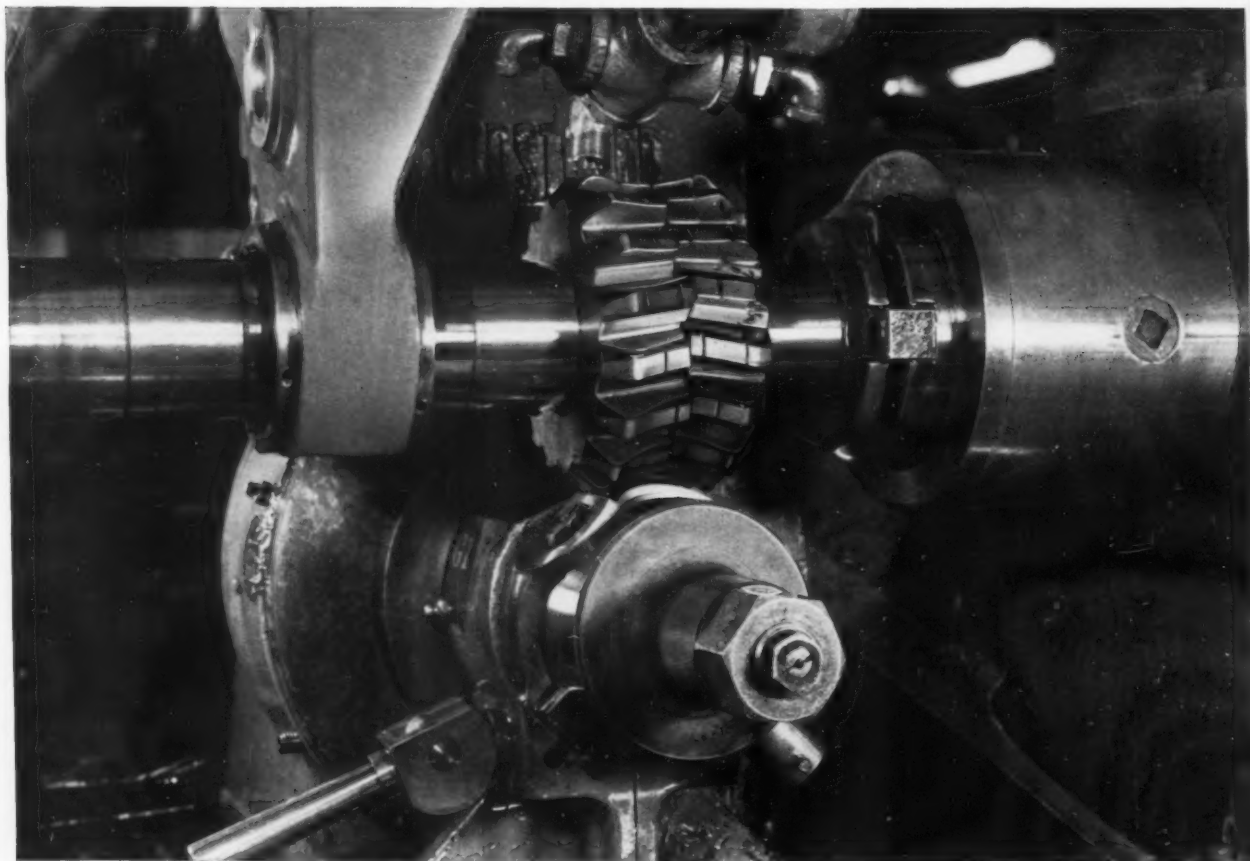
**ROCKFORD, ILLINOIS, U.S.A.**



*milling efficiency ✱  
in tough steel calls for  
expert cutter design*

✱ **interlocking cutter with helical flutes  
in both directions provides positive cutting  
action in high alloy steel**

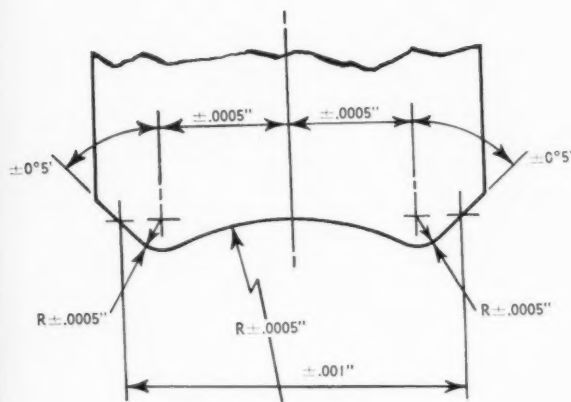
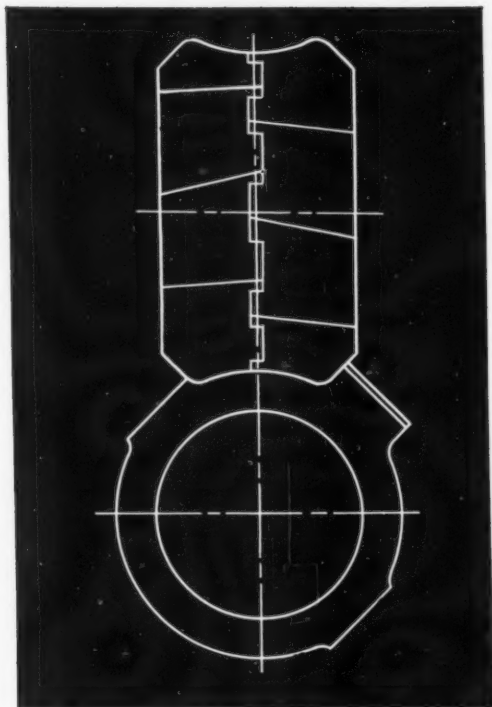
✱ **ground form-relieved cutter provides  
required accuracy for this aircraft part**



Machinery, October, 1957

CENTER OF MACHINE-TOOL EXCELLENCE

**ROCKFORD, ILLINOIS, U.S.A.**



Cutter Tolerances

Accurate milling of this high alloy steel part for Sundstrand Aviation requires a combination of expert cutter design and precision cutter manufacture. To accomplish this job, Barber-Colman engineers designed a ground, form-relieved, interlocking cutter which is 6" in diameter.

Since the material is tough alloy steel for an aircraft part, the cutter is made in two interlocking sections so that each half of the cutter can have helical flutes in opposite directions. This design provides positive axial rake on the angular portion of each half of the cutter, resulting in a shearing action as each side enters the cut. In addition, the alternate tooth design provides maximum overlap for smooth cutting action and fine finish. A free flow of chips is obtained by the combination of the opposite-hand helical flutes and the alternate teeth.

The form on this cutter is ground to hold the close tolerances required on the part. Each of the radii is held to a tolerance of  $\pm .0005''$ . The width of each half from the center of the radius

to the center of the cutter is held to  $\pm .0005''$ , with an overall tolerance of  $\pm .001''$  when the cutter sections are assembled. The form must fit the layout within  $.0005''$ , and this tolerance is inspected to include the effect of axial and radial runout. Accurate tolerances such as these can be provided for your parts by Barber-Colman ground form-relieved cutters.

A fine finish is obtained using a feed of .980 inches per minute and a speed of 80 SFM. The tolerance for finish is 125 RMS. Approximately 200 inches of this tough steel are milled per sharpening.

Results like these are evidence that when you are milling tough materials requiring accuracy and finish, expert cutter design and manufacture are essential for cutting efficiency and good tool life. Consult Barber-Colman cutter engineers on your milling cutter requirements. Their long experience and manufacturing knowledge can save you production time and costs.

## BARBER-COLMAN COMPANY

8210 ROCK STREET • ROCKFORD, ILLINOIS

Hobs • Cutters • Reamers • Hobbing Machines • Hob Sharpening Machines



Machinery, October, 1957

CITY OF MACHINE-TOOL SPECIALISTS

ROCKFORD, ILLINOIS, U.S.A.





Before you buy any turning equipment  
see what you get from  
**SUNDSTRAND**



**FOR EXAMPLE:**

**This Sundstrand Automatic Lathe  
tripled production of aluminum pistons!**

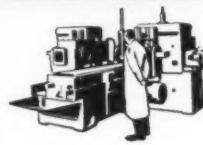
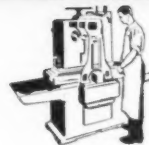
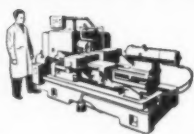
Piston production jumped to 120 per hour, compared with 40 on former equipment, as the result of the change to a Sundstrand Model 8A Automatic Lathe at Wisconsin Motor Corp., Milwaukee. Operations performed include ruffing and finishing the ring grooves, finish turning the outside diameter, facing the piston top, and chamfering the ring grooves — all in a total machining time of just 10 seconds.

In addition to effecting a sizable boost in production, this Sundstrand automatic lathe eliminates the need for finishing and chamfering the ring grooves in a separate machine, as was formerly required. That's the often told story of Sundstrand turning equipment — high production, reduced handling, and improved accuracy on the broadest possible cross section of parts during short, moderate, and long runs.



*"Engineered  
Production"  
Service\**  
\*REG. U.S. PAT. OFF.

**AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS**



Machinery, October, 1957

**MACHINES DESIGNED TO MEET YOUR NEEDS ROCKFORD, ILLINOIS, U.S.A.**

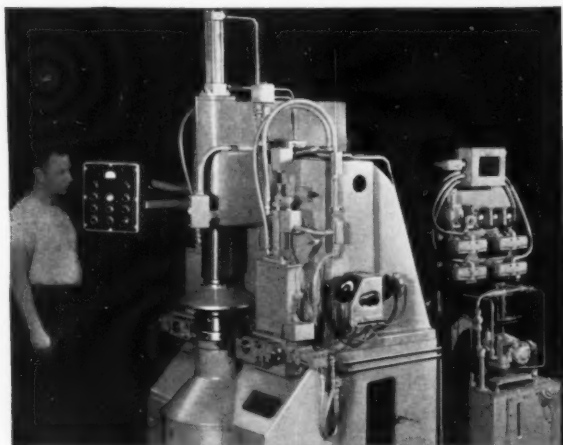


**SUNDSTRAND**

*"Engineered Production"*

**MAKES THE DIFFERENCE**

Any turning job is sure to benefit from the application of years of production and design engineering experience to the machine you get from Sundstrand. In addition, you know the choice will be made from the broadest possible range of machines. The machine on the facing page is an example of how a standard automatic lathe can be provided with multiple tooling for long run turning. On this page are vertical, tracer, multiple tool, and special turning lathes that are setting outstanding performance records.



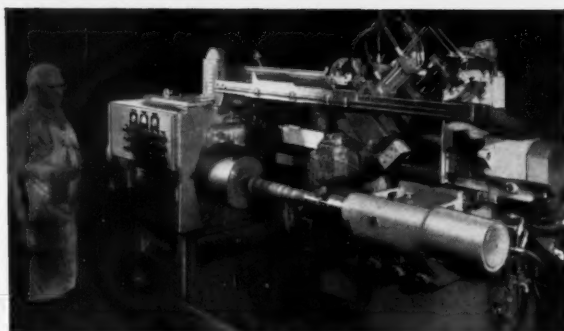
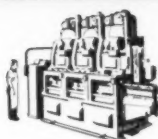
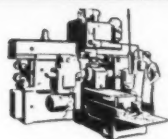
**VERTICAL TURNING**—This Sundstrand vertical automatic production lathe is basically a standard machine with platens for mounting turning or grooving slides, multiple tool slides, or tracer slides. Floor space requirements are reduced materially, and automatic handling can be applied readily. One operator can readily handle several of these machines.

More facts about Sundstrand turning equipment are available in Bulletin 684. Write for your copy today.

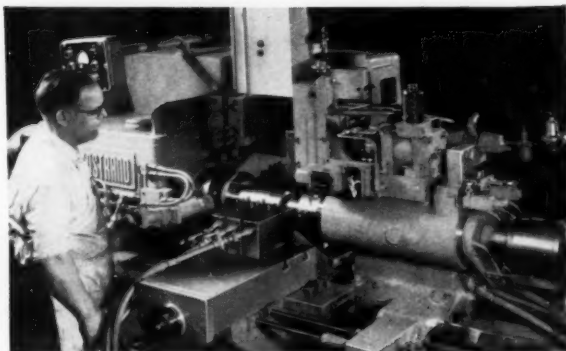


**TRIPLEX RIGIDMILS**

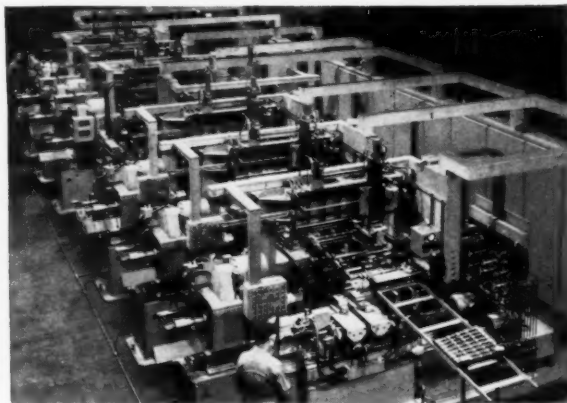
**SPECIAL MACHINES**



**TRACER TURNING**—Template controlled slides on Sundstrand tracer lathes permit taking rough, semi-finish, and finish cuts with one turning tool in an automatic cycle. Axle shafts, stem pinions, and similar irregularly shaped parts are typical of those being turned with high efficiency.



**MULTIPLE TOOL TURNING**—Where a variety of turning, boring, facing, and forming operations are required on a particular part, Sundstrand automatic lathes can be provided with a combination of tools mounted on front, rear, and overhead carriages, permitting the maximum number of surfaces to be machined in a short machine cycle.



**SPECIAL TURNING**—Where production requirements are high, Sundstrand special automatic loading process lathe lines, like this one for automotive camshafts, insure high output of top quality work. The part goes through the complete line without any manual handling whatsoever.

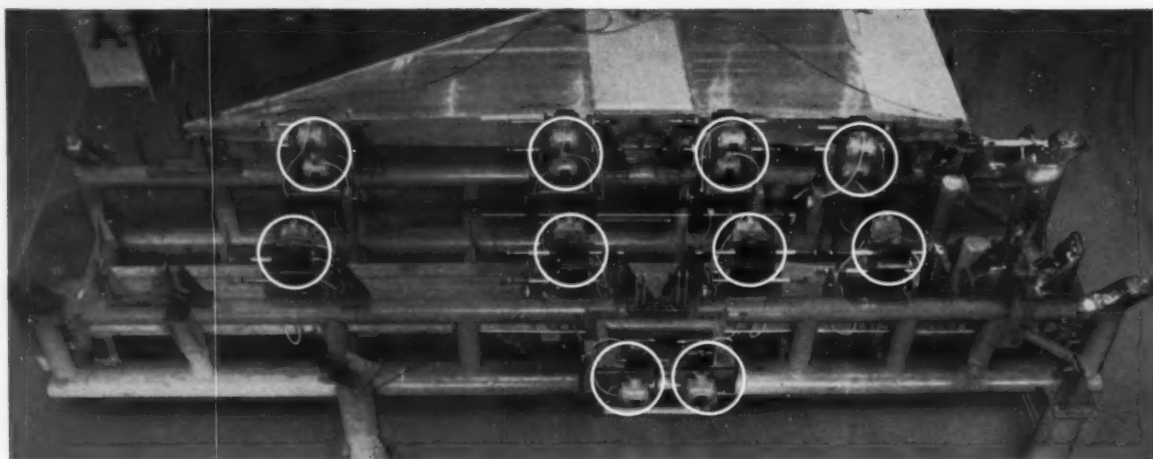
**SUNDSTRAND**  
**Machine Tool Co.**

2530 Eleventh St. • Rockford, Ill., U.S.A.

Machinery, October, 1957

**CITY OF MACHINE-TOOL SPECIALISTS ROCKFORD, ILLINOIS, U.S.A.**





## Precision Boring In Assembly with



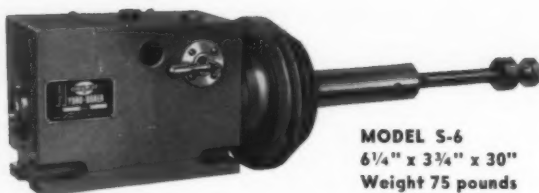
# HYDRO-BORERS

Build precision boring right into your production setups! Shown in the Convair wing job above, sixteen model S-6 Hydro-Borers and four special Hydro-Borers are mounted directly on the wing jig. They are specifically designed for mounting on jigs and multiple-station machines. Find out how Greenlee Precision Hydro-Borers simplify your production setups . . . save time, space and money . . . and bore to a tolerance of .0003".



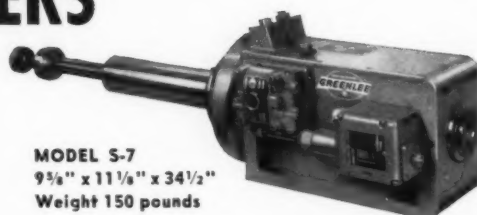
**MODEL C-4**  
11 1/4" x 9" x 30"  
Weight 90 pounds

Model C-4 Hydro-Borer is easily mounted on any type of base. Fixtures mount on face of machine. Adjustable stop in either direction. Optionally furnished with automatic trip and spindle return.



**MODEL S-6**  
6 1/4" x 3 3/4" x 30"  
Weight 75 pounds

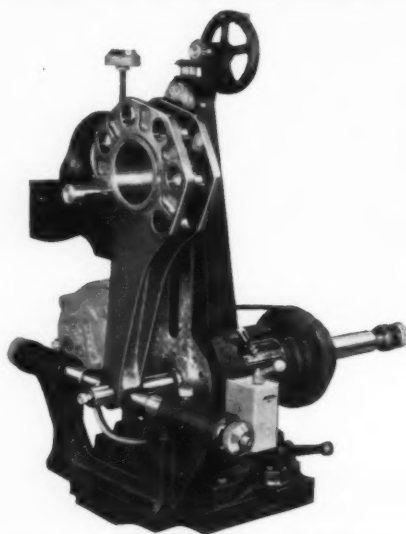
Model S-6 Hydro-Borer can be mounted in various positions on workholding fixtures and assembly jigs. Capable of various feeds in two ranges: .002" to .004" and .0035" to .007" per revolution.



**MODEL S-7**  
9 1/8" x 11 1/8" x 34 1/2"  
Weight 150 pounds

Similar to model S-6 except larger and heavier with greater work capacity. Combines versatility and precision unmatched in its field and range of operations. Patented feed principle enables boring within a tolerance of .0003".

**WRITE FOR FURTHER INFORMATION**



**MODEL A-4 MASTER ROD HYDRO-BORER**

Model A-4 Hydro-Borer for boring crank-pin holes and wrist-pin holes in aircraft engine connecting rods.



**GREENLEE BROS. & CO.**  
1870 MASON AVENUE  
Rockford, Illinois  
Telephone 3-4881



Machinery, October, 1957

MACHINES DESIGNED TO MEET YOUR NEEDS **ROCKFORD, ILLINOIS, U.S.A.**

# NOTHING FINER IN oiltight control stations



**BULLETIN 800T**

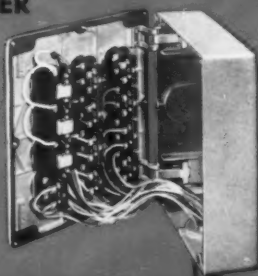


If it's oiltight control stations you want . . . Allen-Bradley has them . . . in any combination from one to sixteen units—or more, if necessary—in oiltight, die cast aluminum enclosures for surface mounting or on a cover plate for flush mounting. There is nothing finer in oiltight control stations—a sales asset on any machine.

Write today for Bulletin 800T.

## HINGED COVER

The 9, 12, and 16-unit control stations have hinged covers. The hinge can easily be changed in the field from one side to the other.



**ALLEN-BRADLEY**  
**MOTOR CONTROL**  
QUALITY

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.  
In Canada: Allen-Bradley Canada Ltd., Galt, Ont.



for machine tool  
application...

BULLETIN  
800T

# oiltight control units

These rugged, reliable units were designed as pilot controls for a-c and d-c magnetic motor control. The oil resistant synthetic rubber cup and washers keep cutting fluids and oil away from the contacts, and thus prevent trouble. Push button units can be furnished with one, two, or four contact blocks—each equivalent to a separate single pole, double throw, switch unit.

For attractive appearance plus long life with reliable operation, select Allen-Bradley control units.

LARGE, FULLY  
GUARDED, BAKELITE,  
BUTTON



TURNED ALUMINUM  
LOCKING RINGS

OIL RESISTANT  
SYNTHETIC RUBBER  
WASHERS

MOLDED BAKELITE  
CONTACT BLOCK

DOUBLE BREAK,  
SILVER ALLOY  
CONTACTS

OIL RESISTANT  
SYNTHETIC  
RUBBER CUP

EASILY  
ACCESSIBLE  
TERMINALS

## PUSH BUTTONS



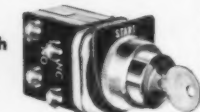
Flush Head  
Start Button

Extended Head  
"Stop" Button



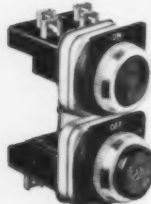
Mushroom Head  
for Easy  
Operation

Push Button with  
Cylinder Lock



Push Button  
with "Selector"  
Sleeve

Wing Lever  
Push Button



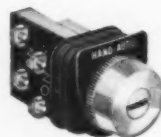
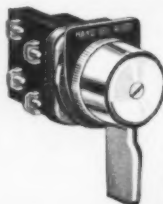
Maintained Contact  
Push Buttons

## SELECTOR SWITCHES



Three-Position  
Selector Switch

Two-Position  
Coin Slot  
Selector Switch



Wing Lever  
Selector Switch

Selector Switch  
with Cylinder Lock

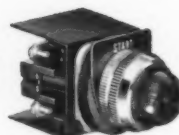


## PILOT LIGHTS



Transformer Type  
Pilot Light

Full Voltage  
Pilot Light



"Press-to-Test"  
Pilot Light

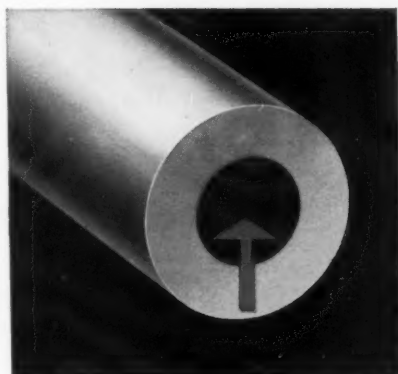


**ALLEN-BRADLEY**  
**MOTOR CONTROL**  
QUALITY

Allen-Bradley Co.  
1316 S. Second St., Milwaukee 4, Wis.  
In Canada: Allen-Bradley Canada Ltd., Galt, Ont.



a hole here makes waste...



a hole here saves waste

**Crucible Hollow Tool Steel** cut sections eliminate the waste and cost of drilling out solid rounds to make ring-shaped or tubular steel parts, or tools with a center hole. By using these hollow bar sections, cut to length, you do away with unnecessary cutting, drilling, and boring operations, increase machine capacity, and cut scrap losses.

These hollow sections, in just about any O.D. and I.D. combination, or thickness you want, are *immediately* available in five most popular Crucible grades: KETOS oil hardening, SANDERSON water hardening, AIRDI 150 high-carbon high-chromium, AIRKOOL air hardening, and NU DIE V hot-work tool steels.

Call your nearby Crucible warehouse for more information, or for speedy delivery. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

**CRUCIBLE**

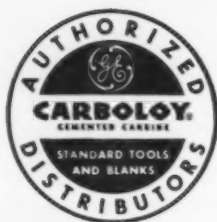
first name in special purpose steels

**Crucible Steel Company of America**

Canadian Distributor—Railway & Power Engineering Corp., Ltd.

For more information fill in page number on Inquiry Card, on page 237

MACHINERY, October, 1957—99



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			<b>RAPID CITY</b> The Balbach Company		

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Authorized Carboloy Distributors can fill your orders faster, because they carry the largest stocks of carbide products in the industry. They back up their complete stocks and fast deliveries with expert technical assistance. Their men are factory-trained

by the nation's largest and most experienced manufacturer of cemented carbides.

The name of your local Authorized Carboloy Distributor is listed above — and his phone number is in the Yellow Pages of your telephone directory. Call him today . . . and get acquainted with the many services only he can offer. *Metallurgical Products Department of General Electric Company, 11147 E. 8 Mile Ave., Detroit 32, Michigan.*

**CARBOLOY®**  
CEMENTED CARBIDES

**GENERAL  ELECTRIC**



a difficult piece to HARDEN . . .



. . . yet it gave no trouble

thanks to

**SAGAMORE**

**DIE STEEL**

Note the complex section of this small ratchet driven friction clutch. Yet, with non-deforming Sagamore Die Steel, there is no distortion or size variation in the intricate webbing.

After being machined from a 3" round bar of Allegheny Ludlum Sagamore, the clutch was hardened from 1775 F. The piece was air cooled and then drawn at 600 F. The result, a Rockwell C hardness of 55/56.

Sagamore is a relatively new type of non-deforming die steel which has had a rapid increase in popularity. It combines excellent non-deforming properties and unusual toughness with freedom from hardening hazards. Similar to high carbon-high chromium steels in behavior and applications, Sagamore has the added advantages of lower hardening temperatures, easier machining and grinding, greater toughness and lower costs.

There's an A-L tool steel to help solve your toughest tool steel problems. For further information, call your nearest office or distributor today, or write . . . Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pa.



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SAGAMORE BLUE SHEET**

A concise 4-page booklet of facts on the handling and shop treatments of Sagamore. Included is complete information on forging, annealing, tempering, etc. and detailed laboratory data on physical characteristics. Ask for your free copy.

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For nearest representative, consult Yellow Section of your telephone book.

For complete **MODERN** Tooling, call  
**Allegheny Ludlum**

WSW 6023





*"No wonder Bill looks so worried  
... the shop just ran out of MX Steel"*

Smart shops, once they have put USS MX Free-Machining Steel to work, take good care *not* to run out of this faster-cutting screw stock.

For MX Brand, although it costs no more than ordinary screw stock grades, gives them money-saving advantages that they can't afford to pass up.

By increasing the rate of production, *MX Steel lowers the cost per part*. By prolonging tool life, *MX Steel reduces down time*. By providing closer dimensional accuracy, *MX Steel helps to minimize rejects*.

These highly desirable results have

been consistently obtained in the production of literally billions of parts—of many different kinds and under widely different conditions. That's why we feel confident that USS MX Steel will cut the cost of any part you now machine from ordinary screw stock.

Remember that USS MX Free-Machining Steel has been successfully machined at speeds up to 350 SFM—speeds far higher than the average (under 250 SFM) used in most shops today.

USS MX Free-Machining Steel is available in both Bessemer and

Open Hearth grades and in all the popular screw stock sizes. It is sold in cold-finished form by your regular supplier, under either the trademark "MX" or his own identifying trade name. In hot-rolled form, MX Steel is available from our district sales offices.

UNITED STATES STEEL CORPORATION, PITTSBURGH  
AMERICAN STEEL & WIRE DIVISION, CLEVELAND  
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO  
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.  
UNITED STATES STEEL SUPPLY DIVISION,  
WAREHOUSE DISTRIBUTORS, COAST-TO-COAST  
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

**Lower costs . . . bigger output . . . longer tool life**

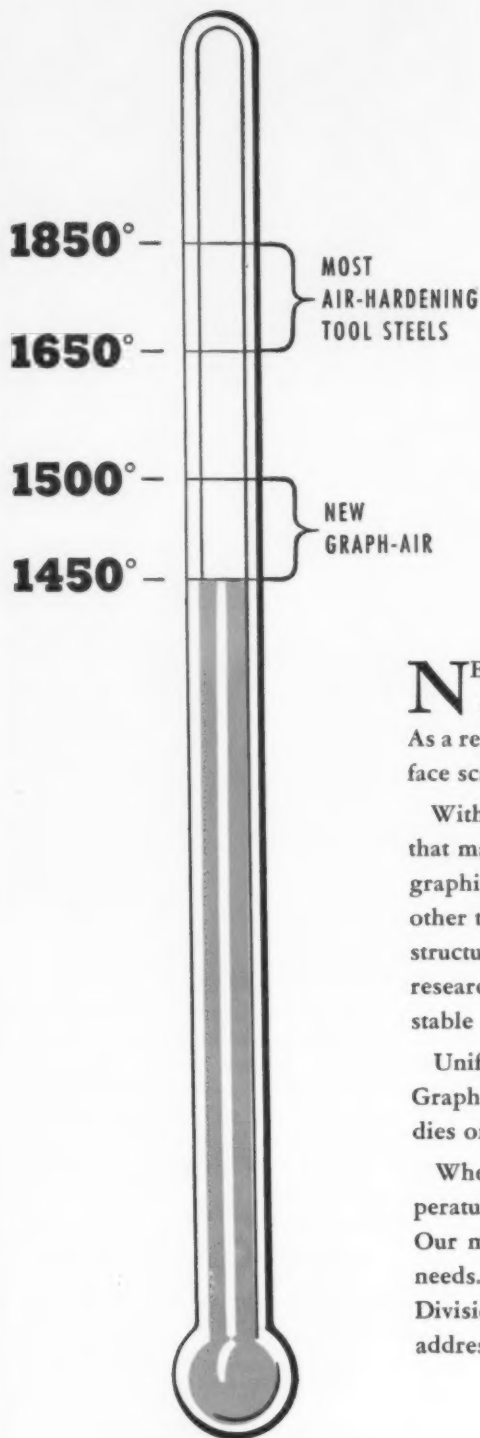


*—when you do the job with free-machining*

**MX**

Registered trademark

**UNITED STATES STEEL**



## New Graph-Air<sup>®</sup> tool steel air-hardens from as low as 1450°F., reduces distortion

**N**EW Graph-Air<sup>®</sup> actually air-hardens from as low as 1450°F. That's as much as 400° lower than most other air-hardening tool steels. As a result, you reduce distortion, simplify heat treating control and surface scaling and decarburization are minimized.

With Graph-Air you get a tougher, more versatile graphitic tool steel that machines faster, wears longer, holds its accuracy longer. The free graphite in its structure makes machining easier. Graph-Air outwears other tool steels because of the uniform, diamond-hard carbides in its structure. And Graph-Air stays accurate longer—the result of painstaking research by Timken Company metallurgists, developers of the most stable tool steels ever made.

Uniform hardening and reduced distortion allow you to machine Graph-Air into more intricate sections. It's your solution for blanking dies or other steel parts that must take abuse.

When you want the best tool steel that air-hardens at the lowest temperature—specify Graph-Air. It's available in solid and hollow bar sizes. Our metallurgists will be glad to recommend the right size for your needs. Write: The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

# TIMKEN *Fine Alloy* STEEL

TRADE-MARK REG. U.S. PAT. OFF.

**SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS STEEL TUBING**



*Machining spur gears made from Bethlehem forged-and-rolled blanks.*

## **When the Blank is Sound, Machining Costs Go Down**

You probably know a machinist whose specialty is gears. Some day ask him what a sound blank means in terms of machining speed. Ask him how a sound blank reduces costs.

Directly or indirectly, his answers will tell you why Bethlehem gear blanks are so widely specified. Wherever these sturdy Bethlehem products are used, their advantages are instantly apparent. Made in a two-way mill that both forges and rolls the steel, they are highly uniform and very strong throughout. Internal structure is excellent. There are no hidden pitfalls beneath the surface to snag the cutting tool, delay the work, or cause rejects. These circular blanks can be turned, bored, faced, and

hobbed with complete assurance of a good finished job in every respect.

You can obtain Bethlehem forged-and-rolled blanks in sizes from 10 to 46 in. OD, heat-treated or untreated. They are available in a wide range of sections. Use them not only for gears, but for crane and sheave wheels, flywheels, turbine rotors, brake and clutch drums, pipe flanges, etc. Many details are covered in Booklet 216, a copy of which will be mailed at your request.

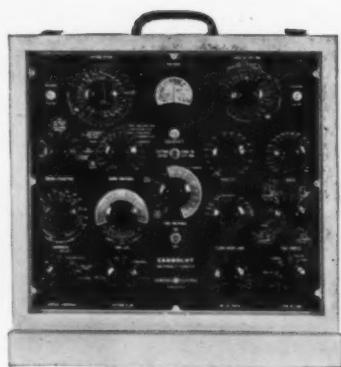
**BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.**

On the Pacific Coast Bethlehem products are sold by  
Bethlehem Pacific Coast Steel Corporation  
Export Distributor: Bethlehem Steel Export Corporation

# **BETHLEHEM STEEL**







**CARBOLLOY®**  
MACHINABILITY COMPUTER

► Ends time-consuming tryout runs;  
saves valuable stock

► Shows you how to get maximum  
machine output at lowest cost

## JUST DIAL IN KNOWN MACHINING DATA... SOLVE TOOL SETUP PROBLEMS IN SECONDS

The Carboloy Machinability Computer accurately predicts how your tools and machines will perform on any job. Faster than any other method of figuring job setups, it calculates the effect of 19 basic machining variables on machine performance, tool life, and output.

With this information, you can check the accuracy of existing setups, determine new machining standards, eliminate costly pilot runs. With the Computer, you can quickly see how to vary operating conditions to gain maximum efficiency from the cutting tool, the machine, and the operator.

Simply set up the known machining variables on the Computer dials . . . then adjust the unknown variable until the Computer shows that the correct setting has been reached.

Hundreds of Carboloy Machinability Computers are now in use throughout industry . . . on jobs ranging from initial setups to trouble-shooting. The Computer is portable and rugged; priced at \$495 (f.o.b. Detroit). For more information, or a demonstration in your plant, write: *Metallurgical Products Department of General Electric Company, 11147 E. 8 Mile Ave., Detroit 32, Michigan.*

*Progress Is Our Most Important Product*

**GENERAL  ELECTRIC**

Now, all former hot rolled  
Crucible REX high speed rounds  
supplied with a new thrift finish



Here's a revolutionary, new Crucible policy designed to provide an improved product—save time and processing costs. Now, Crucible furnishes all REX® high speed rounds from  $\frac{5}{8}$ " up with a machined surface, close to size and free from decarburization. All bars from  $\frac{1}{4}$ " to  $\frac{5}{8}$ " round are supplied cold finished.

This new *thrift* finish means important savings to you — whether you've been paying extra for decarburization and stock removal, or grinding or rough turning rounds in your own shop. Of course, where extremely close tolerances are demanded, precise centerless grinding is still available at a small extra.

It's another Crucible "first" that offers you substantially more for your high speed steel dollar. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

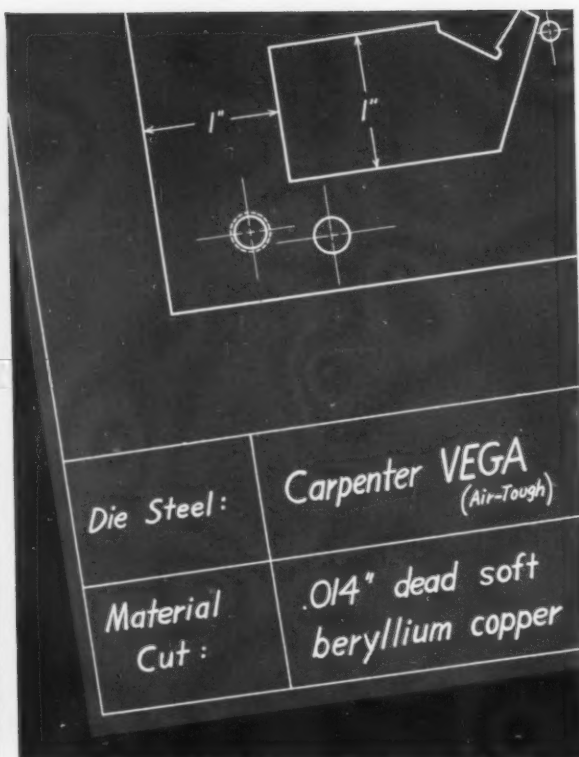
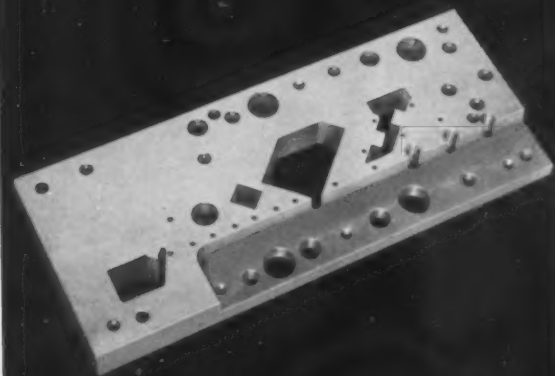
**CRUCIBLE**

first name in special purpose steels

**Crucible Steel Company of America**

Canadian Distributor — Railway & Power Engineering Corp., Ltd.

## FIELD REPORT: NO. 2044A



## WHICH DIE STEEL WOULD YOU USE for hardening accuracy, safety in this critical die section?

Imagine the problems involved in making and heat treating this critical die section for cutting parts from .014\" dead soft beryllium copper.

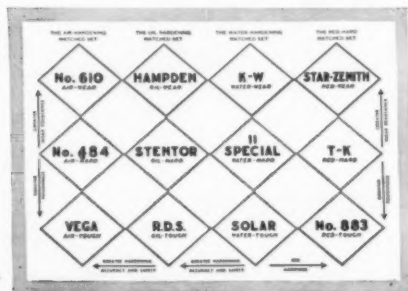
Numerous cut-outs, sharp corners and thinner sections milled almost through the length of the die present man-size problems in getting the section out of heat treatment safely and accurately.

Which die steel would you be willing to trust on this ticklish job?

Here are the results reported by the diemaker, who chose Carpenter VEGA (Air-Tough) Die Steel for the job: "The section is made from a piece of VEGA

1\" x 5\" x 12\". To hold the stock in line, we had to jig bore and hold a line of 1/8\" pilots almost through the entire die length. VEGA permitted us to do this and saved many hours of work over a die made from small sections. The first large perforating punch was also made from VEGA. After heat treatment, the punch entered the die perfectly. If there was any warpage at all in the punch, we couldn't find it."

This kind of performance is readily available to you by simply calling your nearest Carpenter Mill-Branch Warehouse, Office or Distributor. Large local stocks of Carpenter Matched Tool and Die Steels assure immediate delivery.



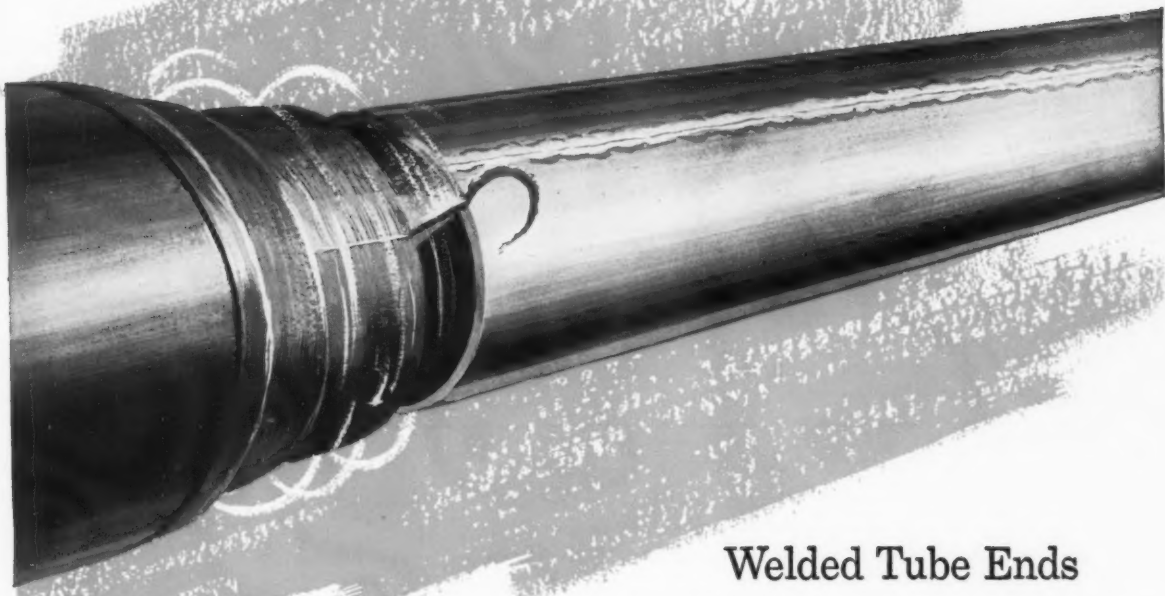
© U. S. Patent Office, The Carpenter Steel Co., Reading, Pa.

# Carpenter STEEL

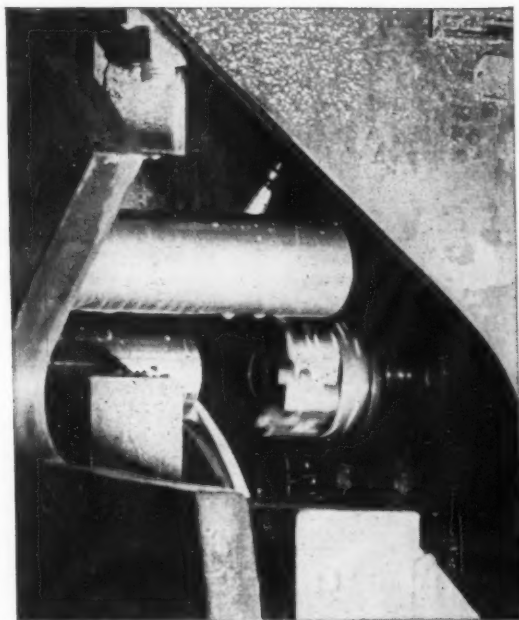
**Matched Tool and Die Steels**

The Carpenter Steel Company, 105 W. Bern St., Reading, Pa.  
Export Dept.: The Carpenter Steel Co., Port Washington, N. Y.—"CARSTEELCO"

## HAYNES Alloys Solve the *Tough* Machining Problems



### Welded Tube Ends Machined in 30 Seconds



No down-time or interference with production while making an interrupted cut on thin welded tubing. 37 tubes are machined per hour in automatic set-up.

HAYNES STELLITE alloy tools are standard equipment on an automatic set-up for machining the ends of very thin, welded tubing. The tools are tough enough to operate for long periods of time under difficult machining conditions.

The tube ends are thin and tend to vibrate . . . the welded seam creates an interrupted cut on every revolution . . . and the cutting tool edge must remain sharp to make a clean cut without damaging the tube ends. Other tools tried on this application either mushroomed the tube ends, or failed by chipping. Only HAYNES STELLITE tools have handled the operation successfully in an automatic set-up.

For complete information on the unusual characteristics of HAYNES STELLITE Metal-Cutting tools, ask for our 16-page booklet. Write Haynes Stellite Company, Kokomo, Indiana.

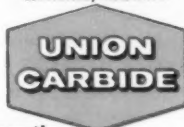


# HAYNES

ALLOYS

HAYNES STELLITE COMPANY

Division of Union Carbide Corporation  
Kokomo, Indiana



"Haynes" and "Haynes Stellite" are registered trade-marks of Union Carbide Corporation.



# Here are 6 good methods for making easy jobs out of hard ones

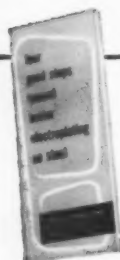


## 1. For precleaning in the plating shop

Oakite precleaners quickly remove the toughest soils that work their way into the plating shop. This 44-page illustrated booklet gives useful information about tank precleaning on pages 6 to 11 and machine precleaning on pages 11 to 14.

## 2. For descaling and derusting steel

Oakite Rustripper saves time by removing heat scale and rust in the same operation that removes oil. Alkaline pickling with Rustripper avoids hydrogen embrittlement, etching of machined surfaces and other disadvantages of acid pickling.



## 3. For electrocleaning steel

Oakite Composition No. 90 is a reverse-current cleaner with great ability to remove oils, smuts and other objectionable films that interfere with good electroplating. Solutions have high conductivity and long service life. Controlled foaming eliminates explosion hazards.

## 4. For electrocleaning brass

Oakite Composition No. 191 scientifically protects brass from the oxygen that tarnishes during the use of reverse current. Solutions have high conductivity, long life and high tolerance for chromic acid carried over by plating racks.

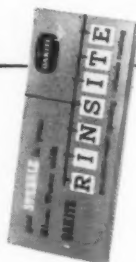
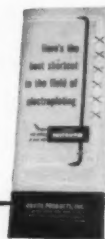


## 5. For electroconditioning zinc die castings

Oakite Composition No. 95 anodically removes all films that would impair the brightness of the plate. Under-surface shadows and anodic blackening are eliminated. A manufacturer of die-cast hardware reported "No. 95 cut our cleaning rejects more than 95%."

## 6. For preventing water spots

Oakite Rinsite causes rinse water to drain rapidly, leaving the plated metal bright, sparkling and completely free from water spots and tarnish. Rinsite is also good as a rust preventive in rinses between barrel finishing operations.



## FREE

Write to  
Oakite Products, Inc.,  
26 Rector St.,  
New York 6, N. Y., for  
the booklets (listed  
below) that  
interest you:

1. "Some good things to know about Metal Cleaning"
2. "Here's the best shortcut in the field of electroplating"
3. "Four good steps toward better electroplating on steel"
4. "What's NEW in electrocleaning brass and other copper alloys"
5. "Good news about electrocleaning zinc-base die castings"
6. "Put SPARKLE in your rinse water with Oakite Rinsite"



Technical Service Representatives in  
Principal Cities of U. S. and Canada

Export Division Cable Address: Oakite



*Navy A5D, largest carrier based jet aircraft*

## **The hook's made of Hy-Tuf** *designed to take exactly this kind of beating*

In a split second, an arresting hook made of Crucible Hy-Tuf® stops a jet dead in its tracks. No other alloy can meet this particular aircraft's needs so well. And Hy-Tuf does it because it was developed by Crucible specifically for aircraft landing gear, hooks, and other such tough applications. Hy-Tuf is covered by AMS-6418B and MILS-7108.

Now other fields are benefiting from Hy-Tuf's tensile strength of over 230,000 psi. By taking advantage of its high strength and high toughness, cross section can be reduced to save weight. This means savings on a variety of applications from heavy-earth-moving equipment to power tools . . . power-driven garden tools . . . and all

types of portable motors where a high strength-weight ratio is important.

Furthermore, special *tools* and *shafts* are logical applications for Hy-Tuf when weight and cross-sectional dimensions must be limited. Where such limitations do not permit sufficient fillet or radius for standard alloys, a higher impact and less notch sensitive alloy, such as Hy-Tuf, is needed.

Ask for data about Hy-Tuf or other ultra high strength steels which may meet your needs more closely.

Write to Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.

**CRUCIBLE**

first name in special purpose steels

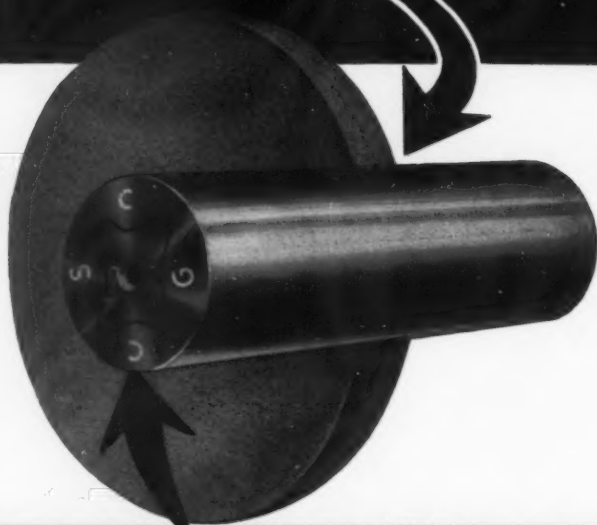
**Crucible Steel Company of America**

# An exclusive GRINDING PROCESS...

makes

## CUMBERLAND STEEL BARS

concentric, straight,  
smooth & really accurate



BE SURE OF THIS MARK ON THE END OF YOUR SHAFTS

## CUMBERLAND GROUND BARS FOR ALL TYPES OF MACHINES

They are carefully ground to our standard manufacturing tolerance, plus nothing to minus .002" on diameters 1-1/8" to 2-7/16" inclusive . . . plus nothing to minus .003" on diameters 2-1/2" to 8" inclusive. Closer tolerance can be furnished, if desired. And, remember, Cumberland Steel Bars are the end result of 109 years' experience,—and every bar is *carefully tested* before shipment. The list of Cumberland's customers reads like the "Blue Book" of Industry. Ask for further information.

### MANUFACTURED IN THREE SPECIFICATIONS

Cumberland Brand—AISI C-1020/C-1025, Elastic Limit 30,000# Min.

Potomac Brand—AISI C-1040, Elastic Limit 45,000# Min.

Cumsco Brand—AISI C-1141, Elastic Limit 57,000# Min.

# CUMBERLAND STEEL COMPANY

CUMBERLAND, MARYLAND, U.S.A.

ESTABLISHED 1845

INCORPORATED 1892



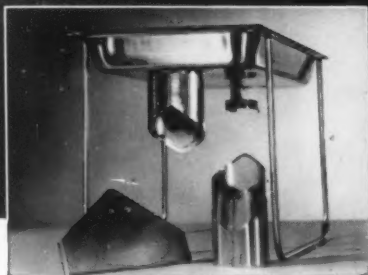
# Tool Steel Topics



On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Distributors:  
Bethlehem Steel Export Corporation



## Brake Die saves shop time in forming overlap for steel spout

The problem sounded simple enough—putting an overlap in a section of 20-gage stainless steel, which was then formed into a spout for use in meat-packaging tables. But getting a tool steel which could do the job more economically than the grade formerly used was somewhat of a challenge for the manufacturer, J. B. Dove & Sons, Inc., Philadelphia.

The answer was Bethlehem Brake Die, supplied by our local tool steel distributor, Hill-Chase & Co. Because of Brake Die's easy machinability and good wear-resistance, the new die minimized manufacturing costs. It also helped in producing a better-looking product. Said one of the Dove engineers: "We like

Brake Die. It's doing a good job for us."

Brake Die, a special alloy steel, is oil-quenched and tempered to develop a fine balance of mechanical properties. It's ideal where wear-resistance, toughness, resistance to impact and good machinability are required.

### Typical Analysis

Carbon 0.50	Manganese 0.90
Chromium 1.00	Molybdenum 0.20

Chances are there might be one or more applications in your shop right now where Brake Die steel could be used to good advantage. Why not talk it over with your Bethlehem tool steel distributor?

## BETHLEHEM TOOL STEEL ENGINEER SAYS:



### How to Shrink-Fit Tool Inserts

Shrink-fitting of tool steel inserts is a procedure which is being widely used to improve the service life of tools. Shrink-fitting is most applicable to rings and cylinders, such as are used in heading and drawing operations where the tools can be shrink-fitted into large retaining rings. The shrink-fit sets up radial compressive stress in the tool, which is available to oppose radial tensile stress set up in service, and thereby improves the performance as compared to solid tools which are not pre-stressed. Shrink-fitting of tools should be carried out as follows:

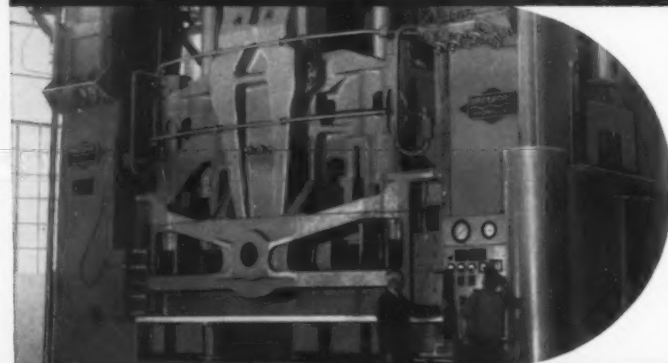
1. The retainer must be of adequate diameter and strength to provide the stresses required on the tool insert. This generally means that an alloy steel capable of hardening to approximately 300/400 BHN must be used. Shock-resisting tool steels heat treated to approximately Rockwell C 48 to 52 are used on heavy duty applications. It is recommended that the OD of the retainer be a minimum of twice the ID (preferably three times the ID).
2. A shrink-fit allowance of .003/.004 in. per in. should be provided for. This means that the OD of the insert is .003/.004 in. per in. larger than the ID of the retainer into which it must fit. These dimensions must be carefully maintained in order to obtain the benefits of shrink-fitting.
3. The OD of the insert and the ID of the retainer should have a smooth finish, preferably produced by grinding.
4. The retainer should be heated to a temperature sufficient to cause the expansion necessary to assemble the insert. Care should be exercised not to exceed the tempering temperature used in heat-treating the retainer. If necessary, the insert may be sub-zero cooled to aid in providing the clearance required for assembly.
5. After assembly of the parts, cooling of the assembly should be rapid enough to prevent over-tempering of the insert by heat transferred from the retainer.



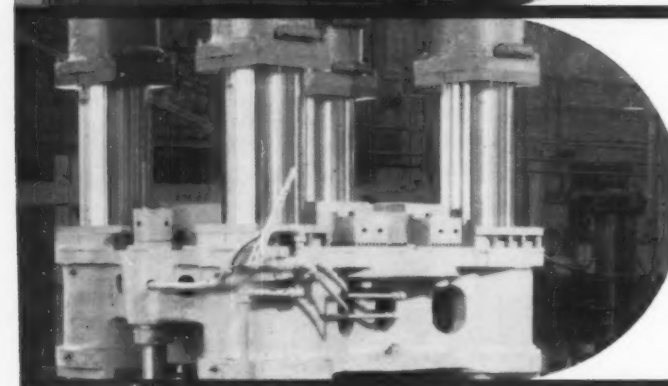
# Special Press Design Features ... Found Under This Seal ...



- 1 Press controls designed to meet specific applications and future adaptations. Automatic interlocking of controls assures accurate sequence functioning of various press components—minimizes dead cycle time.



- 2 Customized close manufacturing tolerances on guide ways assure precision alignment of the platens on this Birdsboro 8000-ton press.



- 3 Rugged design and construction of this 1500-ton Birdsboro press minimize misalignment and assure accurate mating of dies.

In Birdsboro Hydraulic Presses, you can get the most advanced design features in existence. Hydraulic and electric equipment is fully utilized, and each press is piped, wired and tested before shipment for easy and rapid erection and installation. Your Birdsboro repre-

sentative can supply you with a long list of Birdsboro features. Call him in soon. Main office and plant: Birdsboro, Pa., District Office: Pittsburgh, Pa., Subsidiary: Engineering Supervision Co., 120 W. 42nd St., New York 36, N.Y.



## BIRDSBORO

STEEL FOUNDRY AND MACHINE CO.

STEEL MILL MACHINERY • HYDRAULIC PRESSES (Metalworking and Extrusion) • CRUSHING MACHINERY • SPECIAL MACHINERY • STEEL CASTINGS • Weldments "CAST-WELD" Design • ROLLS: Steel, Alloy Iron, Alloy Steel



**HERE'S THE LAST WORD  
IN DEEP HOLE DRILLING**

**WITH MINIMUM DRIFT**

This Westinghouse Atomic Core Plate stands almost seven feet high, is eighteen (18) inches thick and is made of 347 stainless steel weighing over 30,000 pounds.

The new Canton Tool Deep Hole Driller shown here repeatedly put the 13/16 inch drill through this tough steel to form the six inch square openings, with much greater speed and accuracy than by existing conventional methods. By this method costly material was salvaged, and even more important there resulted a considerable savings of time and elimination of work on the succeeding operation. For drilling with a minimum of drift use a Canton Tool Deep Hole Driller.

We'll do custom drilling for you in our own shop or we'll build a machine for you to serve your specific needs.



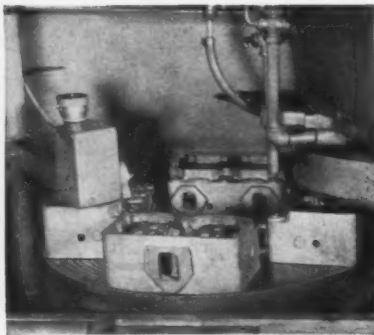
**THE CANTON TOOL MANUFACTURING COMPANY**

**EAST  
CANTON,  
OHIO**

# Whatever your grinding job may be...



200 adjusting screw washers are ground on one side in one hour. Stock removal .025"; limits  $\pm .001$ ".



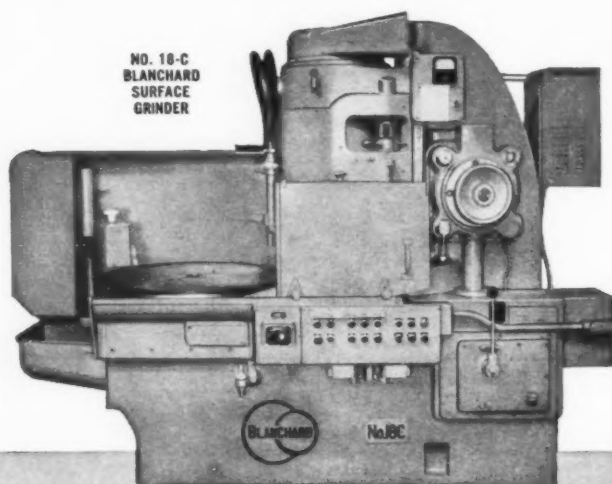
Tops of cylinder heads ground 21 per hour; stock removal  $3/16"$  to  $1/4"$ . Bottoms 55 per hour; stock .012"; limits  $\pm .001$ ".



56 cast iron plates are ground on one side in one hour. Stock removal .140"; limits .001".

## for best results...

The Blanchard No. 18-C Surface Grinder has the speed and precision that guarantees economical grinding on an endless variety of jobs. After the initial setup, the automatic cycle handles every operation from start to finish. The operator is freed to prepare the next load or to operate a second No. 18-C Grinder.



NO. 18-C  
BLANCHARD  
SURFACE  
GRINDER

## Put it on the Blanchard

### The 18-C Automatic Cycle...

Moves chuck to grinding position and starts it rotating

Starts wheel rotation and coolant pump

Provides rapid wheel approach to work

Engages power down-feed at preset rate

Changes to fine feed just before finished size is reached

Stops feed when work is to size — "sparks" out. Raises wheelhead

Stops wheel, coolant pump, and chuck

Moves chuck to loading position — demagnetizes chuck

Can be changed quickly to manual operation

**Automatically Controls Size!**

Send today for your free copy of 18-C folder.



## THE BLANCHARD MACHINE COMPANY

64 STATE ST., CAMBRIDGE 39, MASS., U. S. A.



# **carbide** TOOL NEWS

All you need to sharpen  
any of these **WESSON** tools  
is an Allen wrench . . .

(see page 2)

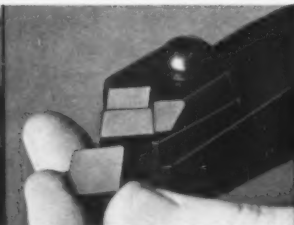


in just ten seconds . . .

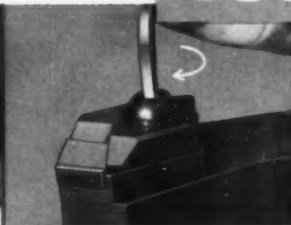
# carbide TOOL NEWS



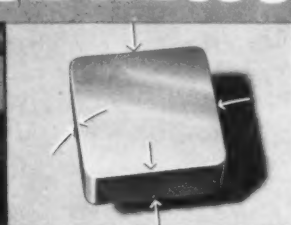
A single turn loosens the insert clamp.



Just turn the insert to put "fresh" edge into cutting position.



Lock the clamp and you're ready to go.



A throw-away insert like this has eight cutting edges.

## How to Sharpen Tools with an Allen Wrench!

All of the **WESSON** tools shown on the preceding page are based on the use of indexable "throw-away" tips. When a cutting edge becomes dull, you simply index the tip to a sharp new edge. After all edges (up to eight) are dulled, the tip is simply discarded.

### Lathe Tools

Experience shows that **WESSON** throw-away tooling is economically suited to at least half of all single point tool operations. There is no tool grinding. Once set up on the machine there is no further setup time. Downtime for tool changes is reduced to the minimum. Ask for Bulletin #5510-M.

### Milling Cutters

Since it takes more time and costs more

to sharpen or set up milling cutters than single point tools, the economic advantages of throw-away tooling in milling cutters are multiplied over single point tools. Moreover, the new **WESSON** milling cutter body, developed and designed specifically for throw-aways, gives ample support even for those heavy roughing cuts. Each blade is indexed just as in a single point tool and requires no adjusting.

### Boring Tools

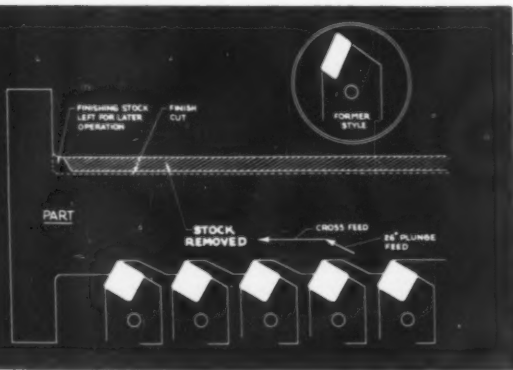
**WESSON** micro-adjustable boring tools with throw-away tips are sweeping the field. Setup is simplicity itself, an Allen-type screw head being provided with a dial graduated to 0.001 inch (each turn is 0.025 in.). Once adjusted the tools stay put. Round, triangular or square inserts can be used with only minor parts changes. Ask for Bulletin #MB-157.

**Flash!**  
**Big Carbide Study**  
**Now Being Completed**

A national survey of practices in industry in specifying, purchasing, and applying carbide tools is now being completed by **WESSON** Company. Methods of reducing costs are included. If you want an advance copy of the findings, reserve your copy today. Write **MARKET RESEARCH DEPT., WESSON COMPANY, 1220 Woodward Heights Boulevard, Ferndale 20, Michigan.**

**Wesson carbide Wessonmetal**

**WESSON COMPANY DEPT. AD**  
1220 Woodward Heights Blvd., Detroit 20, Mich.  
IN CANADA:  
**WESSON CUTTING TOOLS, LTD.**  
93 JUDGE ROAD, TORONTO 18, ONTARIO



**Working with Wesson Saves \$7200 On 1 Job**

When you want to cut tool costs it often pays to break the cost down first. You can often cut it several ways. A **WESSON** service engineer helped prove this on machining OD's of tractor axle shafts.

Tool cost with brazed carbides on a 75 hp lathe was over \$2 per shaft.

A study showed that even though a good steel-cutting carbide was used, there was quite a lot of tool breakage. Frequent tool changes made grinding costs high. A lot of time was lost in setups. Pieces per grind also looked low.

The job was tackled progressively like this:

1 The carbide was changed to *Wessonmetal* #26—a more versatile wide-range general purpose steel-cutting grade.

Its toughness cut the tool breakage way down and boosted pieces per tool change.

2 The tool type was switched to standard easy-to-grind-and-index  $\frac{3}{4}$ " square "on end" inserts in **WESSON** SDR-86B holders.

This doubled the cutting edges per grind, cut tool costs still more, and practically eliminated all setup time after grinding.

In addition to having cut tool cost from \$2.09 to under 7 cents . . .

3 Production per hour was practically doubled—without changing feeds, speeds or depth of cut.

Annual savings on this one job: \$7200.00!

Here are the figures:

	Before	After
Cutting speed, sfpm	275	275
Feed rate per rev.	.017	.017
Depth of cut, max. in.	$\frac{5}{8}$	$\frac{5}{8}$
Machining time, mins.	6 $\frac{1}{2}$	6 $\frac{1}{2}$
Tool change time	5	5
Pieces per hour	2 $\frac{1}{2}$	5
Pieces per tool change	15	40
Pieces per grind (all edges)	30	320
Pieces per tool/insert	120	2560
Grinding cost per tool	\$27.00	\$12.00
Initial tool cost	\$79.77	\$55.28
<b>TOTAL TOOL COST PER PIECE</b>	<b>\$2.09</b>	<b>\$0.066</b>
Annual savings/machine		\$7200.00



Get  
into  
the **BLACK**  
with  
**SIMONDS Rotary FILES**  
and get longer tool life

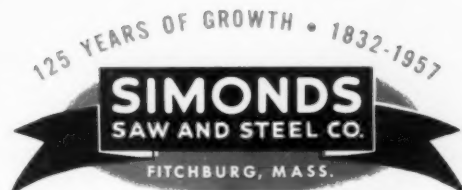
Simonds gives these hardened High Speed Steel Rotary Files an *extra-special* terminal hardening and tempering which pays off to you with a sharp increase in wear-resistance. This final operation gives these files their distinctive *black* color.

And this black color now becomes the "market-mark" of the longest-lasting, fastest-cutting files of this type.

Furnished in Hand Cut or Ground-from-Solid types in a full range of standard shapes and sizes. Special shapes made to order. When dull, we can re-sharpen these files by re-grinding and repeating the terminal hardening process.

Try these easy-to-recognize, longer-lasting Simonds Rotary Files and get *more* for your file dollars.

Look for the Simonds name on the black shank.



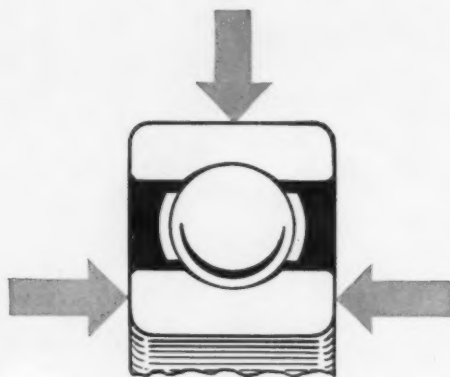
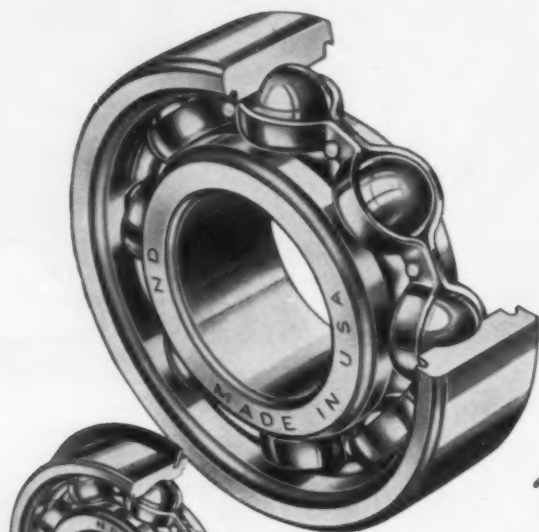
Factory Branches in Boston, Chicago, San Francisco and Portland, Oregon  
Canadian Factory in Montreal, Que., Simonds Divisions: Simonds Steel Mill,  
Lockport, N. Y., Heller Tool Co., Newcomerstown, Ohio  
Simonds Abrasive Co., Phila., Pa., and Arvida, Que., Canada

**For Fast Service from Complete Stocks**



Call your  
**SIMONDS**  
Industrial Supply  
DISTRIBUTOR

# NB FACTS



## The Word *Versatile*

### Fits Like A Glove!

**Fits because**—this basic New Departure ball bearing, more widely used than any other antifriction type, does much more than carry RADIAL loads—it locates the shaft it supports against THRUST LOADS FROM BOTH DIRECTIONS equally well!

**Fits because**—with a simple snap ring added, it does away with inside housing shoulders, simplifying mounting and cutting machining costs!

**Also**—with efficient Senti-Seal added, without change in exterior dimensions, it eliminates a separate outside closure—assures protection from outside dirt!

**And**—with Senti-Seals on both sides, this same basic bearing does away with all separate seals, eliminates all need for lubricating fittings—requires no attention for greasing!

**Finally**—it is a long-lived, non-separable unit that calls for no shims or other devices for periodical adjustments.

So, specify New Departures of the type that assures you maximum application proficiency and economy.



**NEW DEPARTURE**

DIVISION OF GENERAL MOTORS, BRISTOL, CONN.

NOTHING ROLLS LIKE A BALL

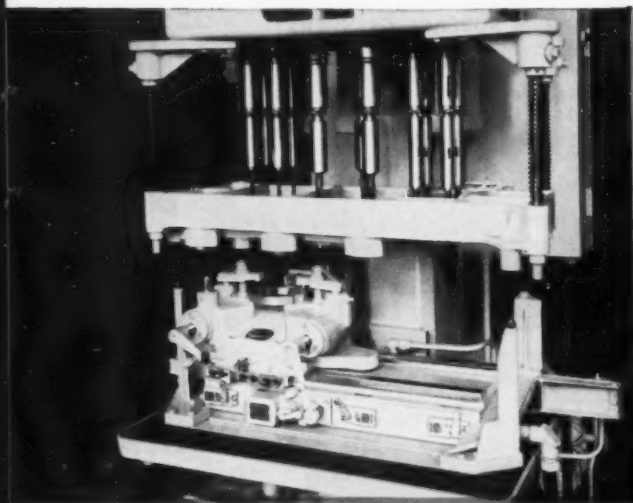
# Natco Naturals

*Cost-Cutting Ways*

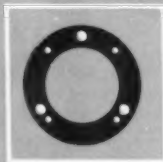
*You Can Use*

*Standard Multi-Spindle Natcos*

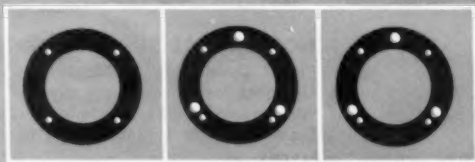
Any time your parts require machining *more than one hole*—drill, bore, face or tap—it may well be a "Natco Natural." Your standard Natco will produce substantial savings in a surprising number of situations, *even in small job-shop lots!* Call in your nearby Natco field engineer; he'll tell you in short order whether you've got a "Natco Natural" there.



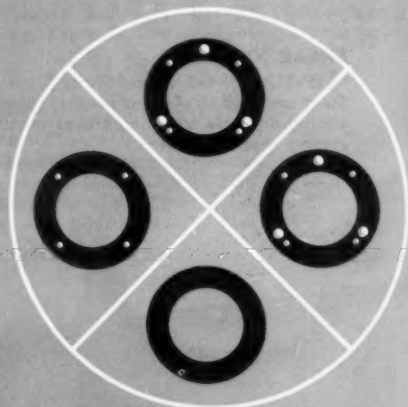
**Straight-line indexing on a Natco H6 produces 49 parts per hour.** 4 holes drilled in first position, 3 holes drilled in second position, 4 holes c'bored in third position. One part completed every three strokes. Automatic cycling frees operator for other work. Illustrations below show three other ways of handling this part.



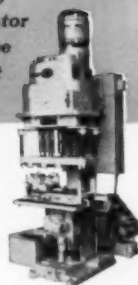
**45 parts per hour.** Inexpensive box jig. Operator positions jig under appropriate spindles. One complete part for 3 strokes of machine.



**75 parts per hour.** 3-position fixture. Operator shifts parts after each stroke. One part completed every stroke.



**155 parts per hour.** Rotary 4-position index table. Operator unloads and loads while three operations proceed. One part completed every stroke.



**Standard multi-spindle Natcos range from 1 hp, 10-spindle machines to 25 hp machines with up to 72 spindles.** Spindles in standard Natcos are driven through universal joints and located by either adjustable arms or bored slip plates.



**National Automatic Tool Company, Inc.**

Richmond, Indiana

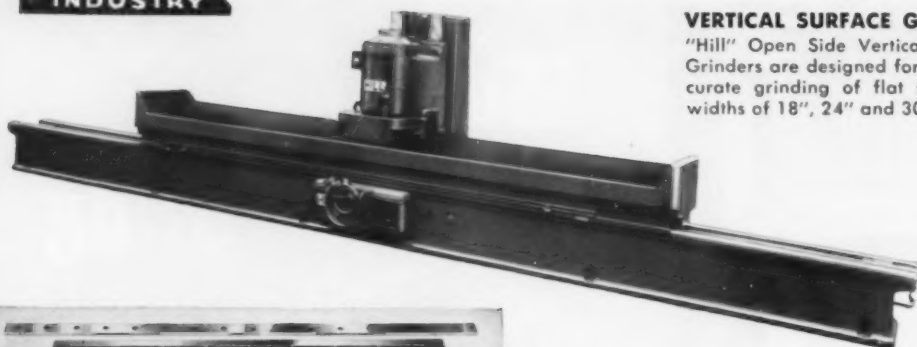
Multi-spindle drilling, boring, facing & tapping machines. Special machines for automatic production.

Call Natco Offices in Chicago, Detroit, New York, Buffalo, Boston, Philadelphia, Cleveland, Los Angeles; distributors in other cities.



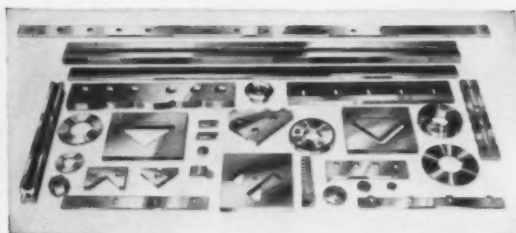


# HILL ACME



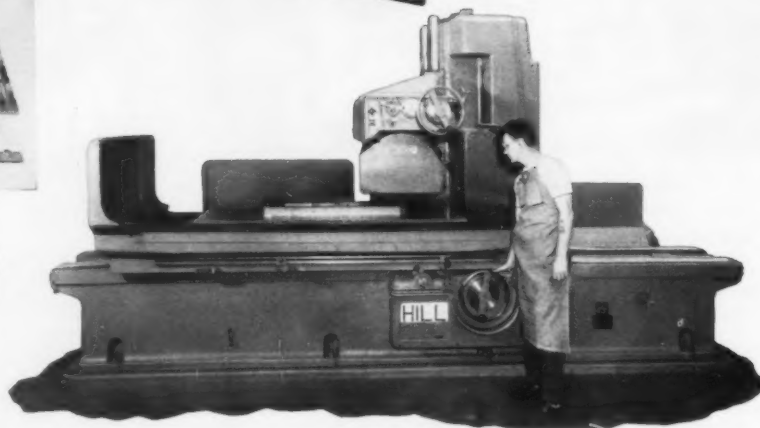
## VERTICAL SURFACE GRINDERS

"Hill" Open Side Vertical Spindle Hydraulic Surface Grinders are designed for rapid stock removal and accurate grinding of flat surfaces. Furnished in table widths of 18", 24" and 30"; table lengths 60" to 240".



## SHEAR KNIVES

"CLEVELAND" Knives and Shear Blades, Solid and laid steel shear blades; rotary slitting and side trimming knives; metal cutting machine knives.



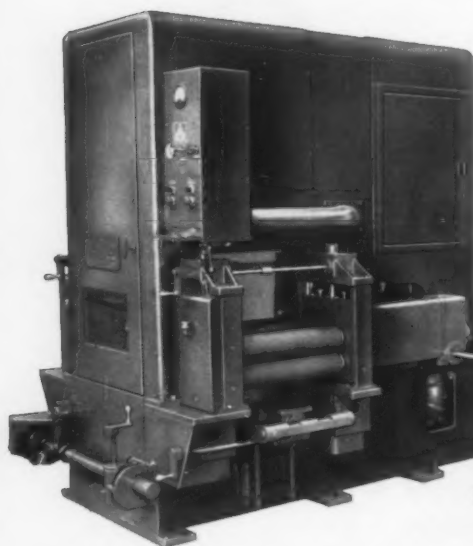
## HORIZONTAL SURFACE GRINDERS

"Hill" Open Side Horizontal Spindle Hydraulic Surface Grinders for accurate grinding of flats, angles, irregular and special shaped surfaces. Furnished in table widths from 18" up to 36"; table lengths 60" to 240".

## ABRASIVE BELT GRINDING & POLISHING MACHINE

(Pinch Roll Type)

For pre-finishing, conditioning and polishing sheets, plates, strips or blanked-out shapes in flat form. Used as single units or in multiple units for progressive line polishing.



The basic HILL two-roll vertical head with endless abrasive belt. Used in both the Pinch-Roll and the Hydraulic Table types.

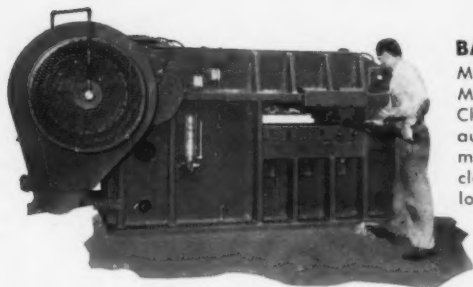


## ABRASIVE BELT POLISHING MACHINE

(Hydraulic Table Type)

For flat polishing of sheets and plates of ferrous and non-ferrous metals. Made in a variety of table widths and lengths with fully hydraulic reciprocating table.

# Tools for Industry

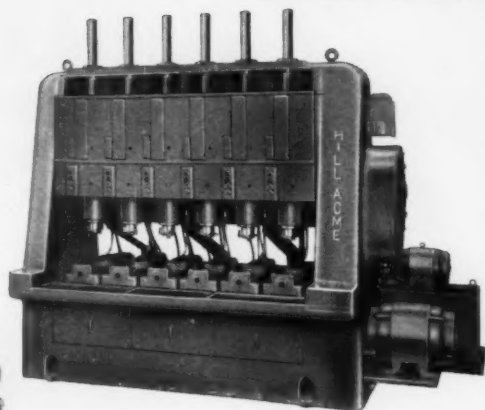


## BAR-BILLET SHEARS

Modern, efficient design. Made in 3" to 6 1/2" sizes. Choice of hand, semi-automatic or fully automatic feed. Assures clean, square cuts with low maintenance.

## ALLIGATOR SHEARS

"CANTON" Alligator Shears are the most rugged, powerful and trouble free shears ever built for processing scrap. Modern design has produced a stronger shear, with fewer parts, and positive lubrication. Made in a full range of sizes to meet every condition.



## TAPPING MACHINES

"ACME" model XC-W six spindle Coupling Tapper. Built in 1" capacity and larger, in 6 or 8 spindle. Can be adapted as a nut tapper.

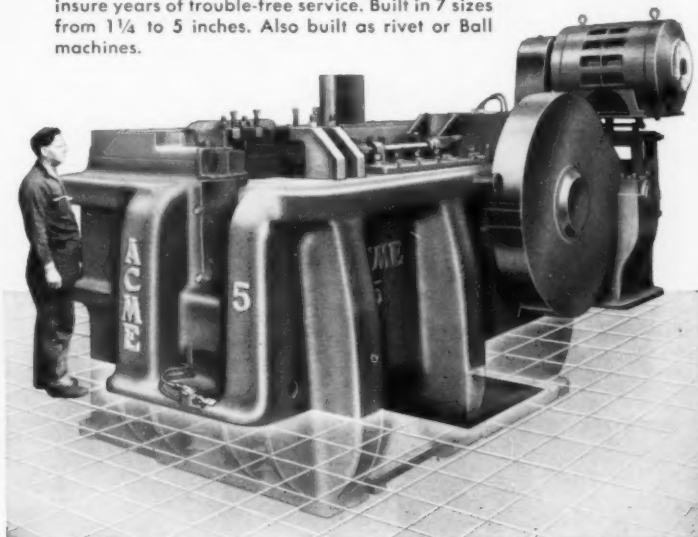
## FORGING MACHINES

"ACME" XN Forging Machines produce accurate, quality forgings for long uninterrupted periods. Massive construction and simplicity of operation insure years of trouble-free service. Built in 7 sizes from 1 1/4 to 5 inches. Also built as rivet or Ball machines.



## THREADING MACHINES

"ACME" HA Single and Double Spindle Threading Machines are equipped with tangent or hob type die head which assures economical, accurate, high speed production. Furnished in sizes from 1" to 2 1/2" capacity.

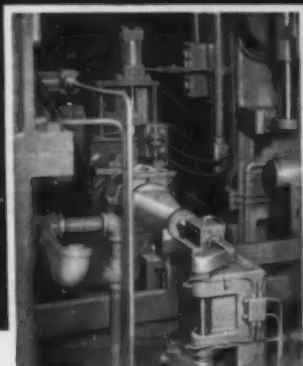


# THE HILL ACME COMPANY

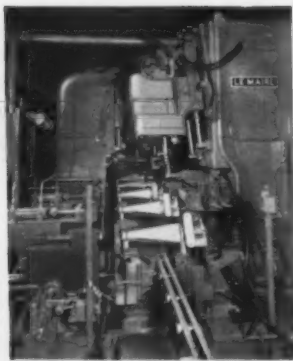
1201 WEST 65th STREET • • • CLEVELAND 2, OHIO

"HILL" GRINDING & POLISHING MACHINES • HYDRAULIC SURFACE GRINDERS • ALSO MANUFACTURERS OF "ACME" FORGING  
THREADING • TAPPING MACHINES • "CANTON" ALLIGATOR SHEARS • BILLET SHEARS • "CLEVELAND" KNIVES • SHEAR BLADES

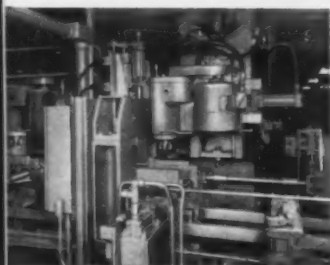
# PRODUCING



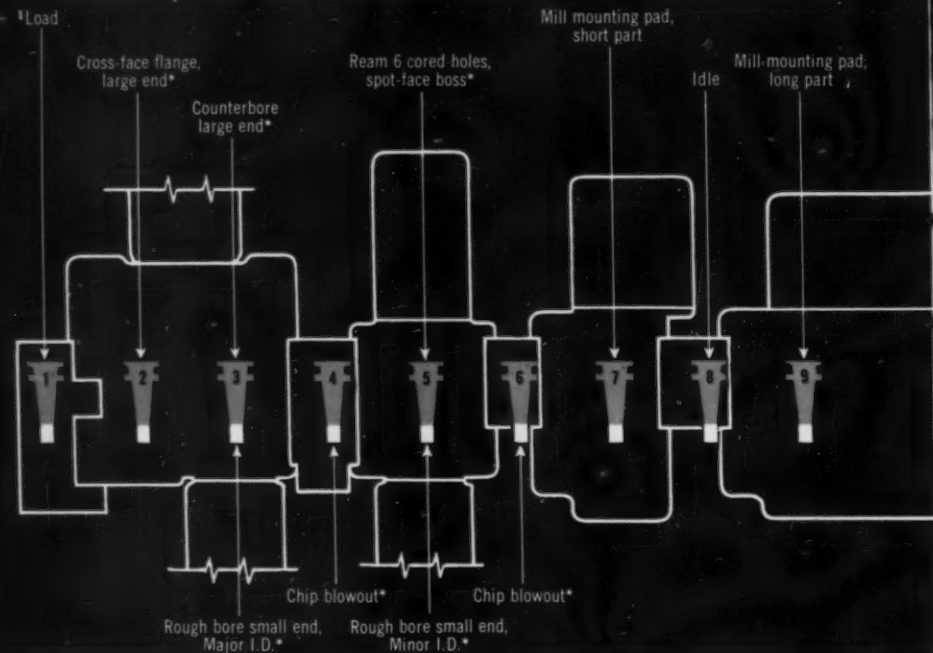
Rotating station. Plate moves in, locates on part and trips limit switch, causing rotation for next operation.



Hardened pickup members hold part during transfer, locate it approximately prior to nesting in precision locators.



Station 7 (left) mills mounting pad on short part. For long parts, this station is automatically skipped for Station 9 (right).



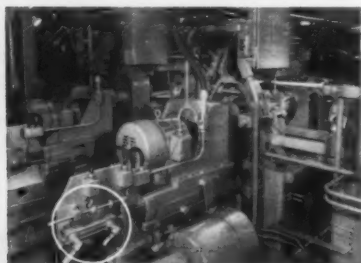
## MACHINING TIME—20 SECONDS CHANGEOVER TIME—ONE SECOND

This LeMaire 21-station transfer machine, installed by one of the automotive "Big Three," completely machines 180 aluminum transmission extensions per hour. It handles two different length parts . . . and is changed over from one part length to the other with the one-second flip of a switch.

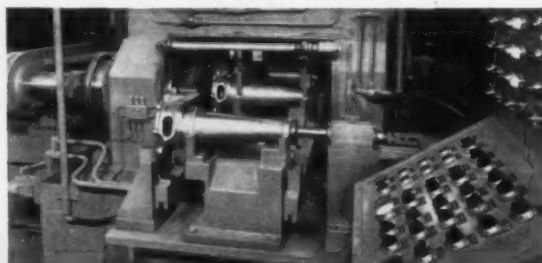
Most of the stations process both part lengths; others handle either the long or the short part exclusively. On the latter, parts which the station is not designed to process are passed automatically to the next operating station. Sensing devices, actuated by one selector switch on the main control panel, accomplish the changeover to machine different part lengths without manual adjustment of dog rails or limit switches, and without changing tool spacing, feeds or speeds.

Other features: • Walking beam transfer with hardened pickup members and precision hydraulic control • Unitized construction • Complete electrical interlock • Individual controls at each station • "PresTest" lights on main panel • LeMaire patented test panel in all control cabinets • Automatic lubrication • Electrical and hydraulic systems to J.I.C.

This is just one of many successful, *producing* installations designed, manufactured and tooled by LeMaire. Let us help with *your* production machining problems.

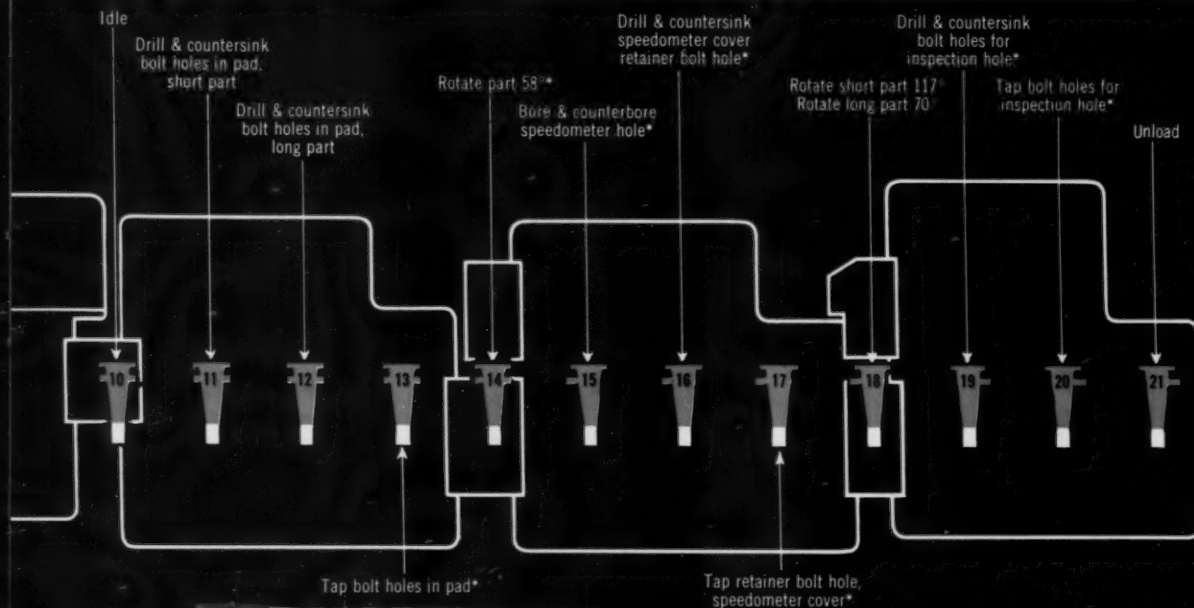


Note hydraulic cylinder which re-positions dog rail on hydraulic slide unit for part length change. Actuated by selector switch on main panel.

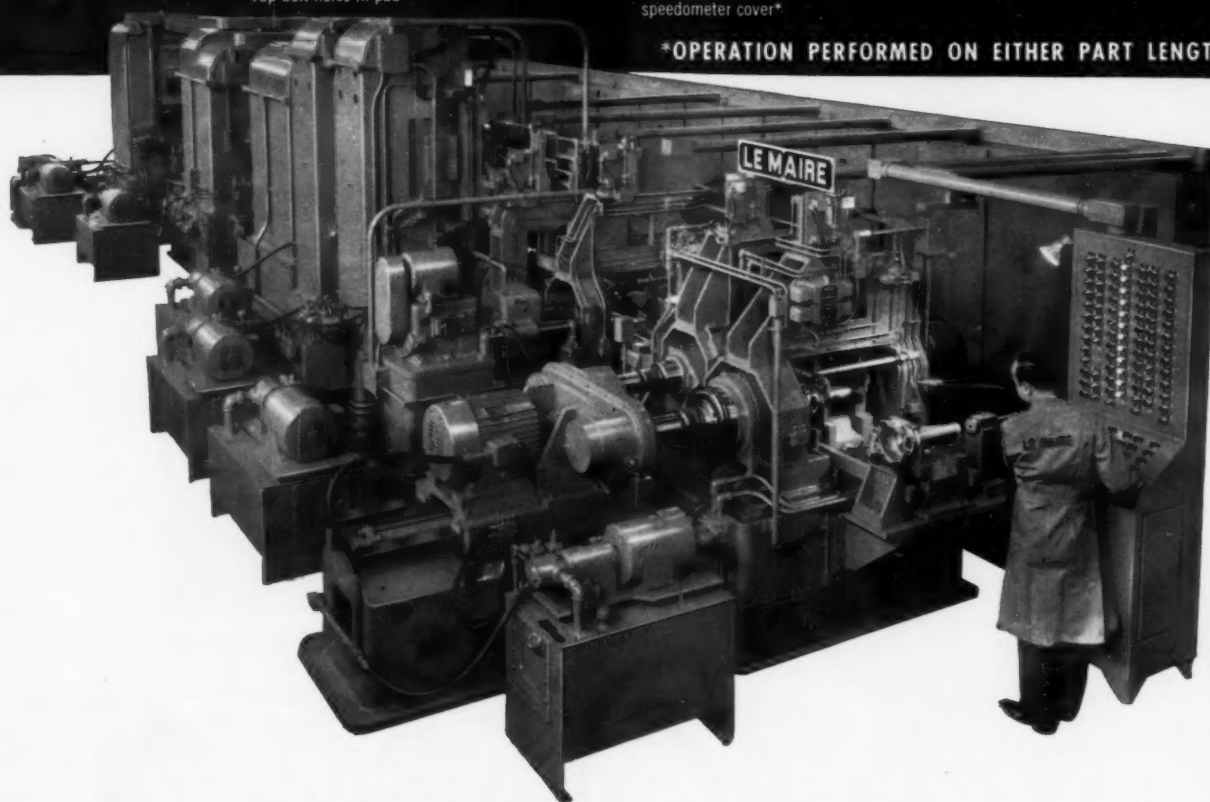


Load station. Placing part in half locators depresses limit switch, causing interlock. Pressing cycle-start button causes walking beam pickup and transfer to No. 2.

# with **LE MAIRE**



\*OPERATION PERFORMED ON EITHER PART LENGTH



# LE MAIRE

TOOL AND  
MANUFACTURING  
COMPANY

2657 SOUTH TELEGRAPH ROAD • DEARBORN, MICHIGAN

Designers and Builders of Special High-Production Machines





**BEFORE  
BRUSHING**



**AFTER  
BRUSHING**

## Precision brush finishing

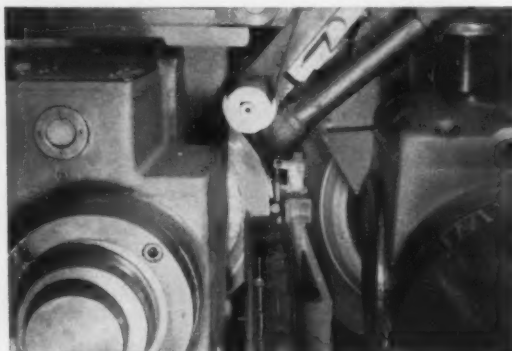
***mass-production method***

**P**RECISION parts by the thousands can be surface finished . . . at high, continuous rates. The method . . . Osborn Centerless Brushing . . . is fast, economical.

Cylindrical parts are fed past a revolving Osborn Matic® Brush. Surface finishes are refined to low microinch readings, grinding burrs are removed and surface junctures blended to reduce stress concentrations.

With Osborn Centerless Brushing, uniform quality of product is maintained. A wide variety of parts can be handled with the same basic brushing method.

Why not check what operations in your plant can be done at lower cost with power brushing. An **Osborn Brushing Analysis** will show you how. There is no obligation, of course. Write today. *The Osborn Manufacturing Company, Dept. D-39, Cleveland 14, Ohio.*



*Cylindrical parts precision finished automatically and economically with Osborn Matic® Brushes.*

Write **TODAY**  
for the new  
100-page Osborn  
Catalog 210-C

**Osborn Brushes** 

BRUSHING METHODS • POWER, PAINT AND MAINTENANCE BRUSHES • BRUSHING MACHINES • FOUNDRY PRODUCTION MACHINERY

They got what they wanted with

# DANLY

**PRESSES**

**SEE HOW ONE  
LEADING MANUFACTURER DOUBLED  
LAMINATION PRODUCTION**

Production of motor lamination stampings was actually more than doubled—from 100,000 to 230,000 units per press per day—from each of five new Danly Autofeeds. High precision carbide dies have a life expectancy of 200,000,000 pieces . . . even stoppages for die maintenance have been reduced by 80%.

If you want speed, dependability, big volume and small unit cost, you'll get what you want with Danly Autofeed Presses. See how you can increase stamping production in your shop.

You'll want the whole story. Send for this catalog with all the details including press specifications and drawings. Write today to DANLY MACHINE SPECIALTIES, INC., 2100 S. Laramie Ave., Chicago 50, Ill.



# Acme-Gridley

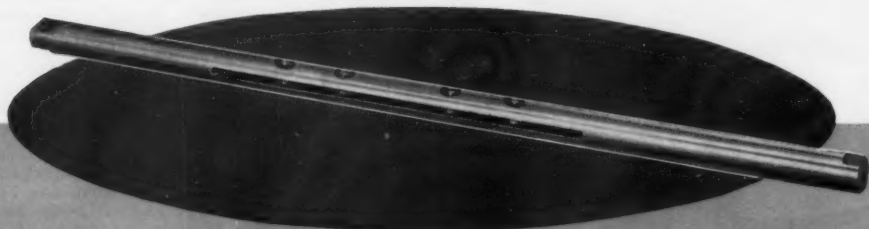


Acme - Gridley 1 1/4" Model RB 8-spindle Bar Automatic  
with spindles locked against rotation so that they function  
as work holders for 16 operations.

# basic design + proper tooling

... reduces machine investment 75%

... reduces cost-per-piece 90%



This customer wanted to determine the quickest and most economical way to make double-barrel carburetor shafts. NAMCO engineers recommended a procedure that resulted in his producing these shafts at one-tenth the previous unit cost and on a machine that required but one-fourth the equipment investment needed to accomplish the job by in-line manufacturing methods.

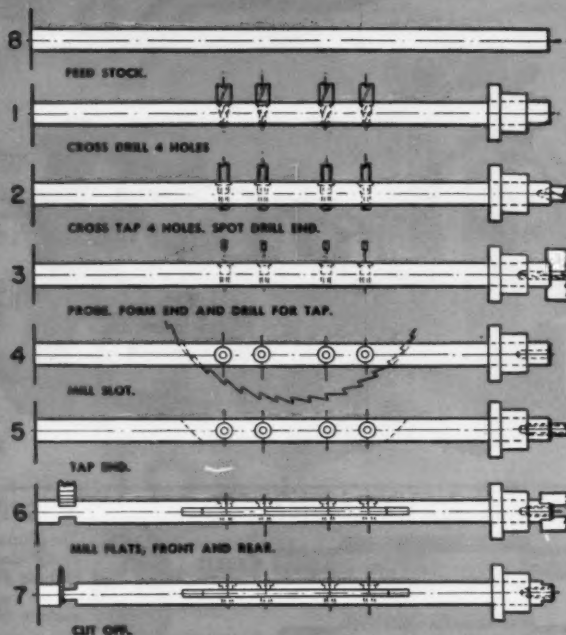
Selected to do the job was a standard 1 1/4" RB 8-spindle Acme-Gridley bar automatic. Each of its eight spindles was locked against rotation so that it functioned as a work holder as the machine indexed the work from position to position. Because accurate indexing is one of the inherent features of Acme-Gridley basic design, it assured proper alignment of the work with the standard and special attachments on the end and side tool-slides. This permitted holding the close tolerances required on the part while performing the 16 operations indicated on the tooling diagram shown at the right.

★ ★ ★

WRITE FOR YOUR FREE COPY OF TF-44. It shows how maximum production versatility and cost reduction can be realized in your manufacturing operations.

## JOB FACTS

PART.....Carburetor Shaft MACHINE TIME....6.7 Seconds  
MATERIAL.....Brass GROSS PRODUCTION 533 per hr.  
NUMBER OF OPERATIONS.....16



*why don't you*

**INDEX**... to lower  
machining costs...



with *Acme-Gridley*

**CONTROLLED CYCLE**

# National Acme

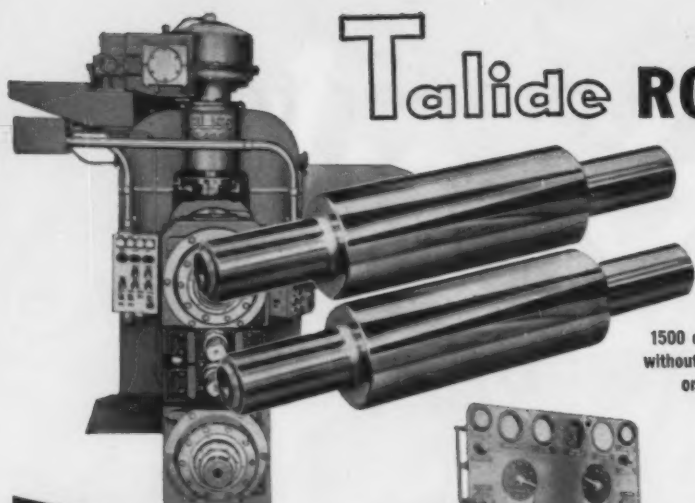
THE NATIONAL ACME CO.  
179 EAST 131ST STREET  
CLEVELAND 8, OHIO

Sales Offices... Newark, N. J.... Detroit, Mich.... Chicago, Ill.

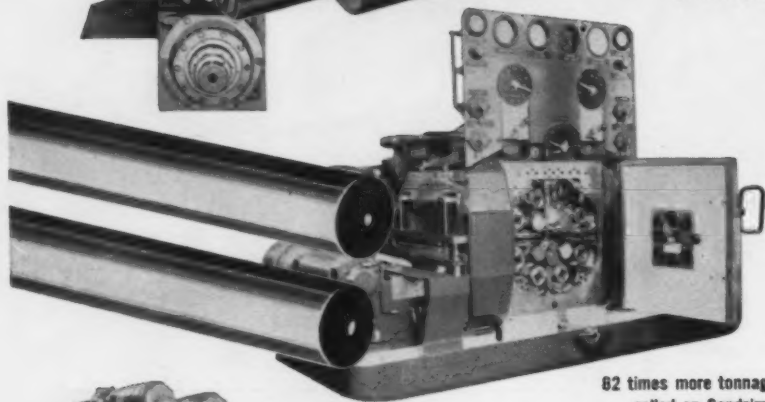
For more information fill in page number on Inquiry Card, on page 237

MACHINERY, October, 1957—127

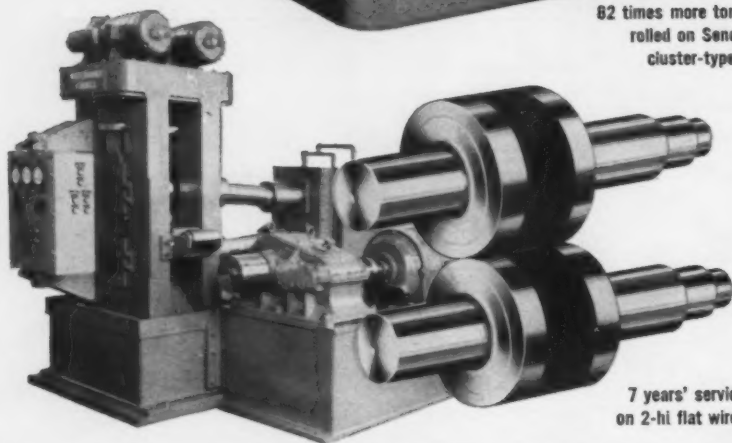




1500 coils rolled  
without a regrind  
on 4-hi mill.



82 times more tonnage  
rolled on Sendzimir  
cluster-type mill.



7 years' service life  
on 2-hi flat wire mill.

# Talide ROLLS OUTLAST ALL OTHERS!

Talide rolls have proven far superior to both steel rolls and carbide rolls of any other make.

During the last five years Talide rolls have been adopted by every major strip steel producer. Metal Carbides pioneered and developed tungsten carbide rolls and successfully adapted them to all types of rolling mills including STECKEL, BLISS, UNITED, MESTA, STANAT, SENDZIMIR, WATERBURY-FARREL, TORRINGTON, RUESCH, FENN, WEAN, COLD METAL, etc.

Talide work rolls are ultra-hard, extremely dense and porous-free. Manufactured from highest purity tungsten carbide powders, the surface finish of a Talide roll is smoother than one micro-inch. Hard as a diamond, it will take a "bigger bite" than a steel roll. Strip steel of all analyses can be rolled down to thinner gauge, with more accuracy, greater reductions and with fewer anneals than possible with any other roll.

## ONLY TALIDE WORK ROLLS GUARANTEE THESE ADVANTAGES

- ★ MORE PRODUCTION
- ★ BETTER FINISH
- ★ LONGER LIFE
- ★ HIGHER SPEEDS
- ★ CLOSER TOLERANCE
- ★ IMPROVED PHYSICALS
- ★ GREATER REDUCTION
- ★ LESS DOWN TIME
- ★ FEWER REJECTS
- ★ LESS MAINTENANCE

### EXCLUSIVE REPAIR SERVICE



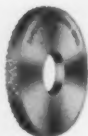
Broken or damaged carbide rolls can be re-worked to first class condition with all defects eliminated at one-half original cost. Only Metal Carbides offers this service—because of its exclusive hot press method.

Talide Rolls are made in lengths up to 100", diameters up to 25", and up to 5000 lbs. by weight.

Metal Carbides Corporation,  
Youngstown 12, Ohio.

Send for new 76-page catalog 56-G

### SUPERSET GRINDING WHEEL



The Superset diamond grinding wheel was specially developed for grinding carbide rolls to highest possible surface finish and luster. Made of 4-8 micron size diamond dust, it imparts a surface finish far superior to any other commercial wheel. Available in sizes up to 25" diameter



HOT PRESSED AND SINTERED CARBIDES • VACUUM METALS  
HEAVY METAL • ALUMINUM OXIDE • HI-TEMP. ALLOYS  
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY



## *Briquetting—Powder Metal Forming?* investigate **CLEARING HYDRAULICS**

Clearing engineers are at your disposal for help in selecting the proper press for your particular needs.

Deep, difficult draws, straightening, forming and hobbing—these are more conventional operations where Clearing Hydraulic presses also excel. We have some remarkable case histories on some of these presses—in fact, a wealth of information on Clearing hydraulics. Why not send for it right away?

### **Working With These Metals?**

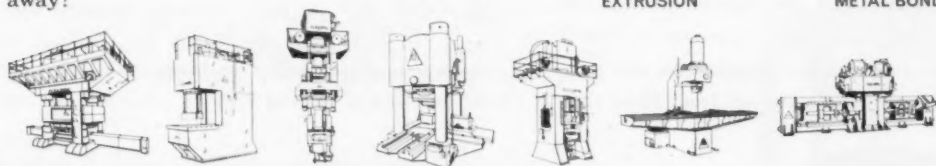
TITANIUM  
TANTULUM  
COLUMBIUM

URANIUM  
ALUMINUM  
ZIRCONIUM

**There is a CLEARING HYDRAULIC PRESS especially suited for each of the following specialized operations:**

POWDERED METAL  
FORMING  
BRIQUETTING  
EXTRUSION

FORGING  
DIE QUENCHING  
RUBBER PAD FORMING  
METAL BONDING



## **CLEARING PRESSES**

THE WAY TO EFFICIENT MASS PRODUCTION

**CLEARING MACHINE CORPORATION** division of **U. S. INDUSTRIES, INC.**

6499 W. 65th STREET, CHICAGO 38, ILLINOIS • HAMILTON PLANT • HAMILTON, OHIO

For more information fill in page number on Inquiry Card, on page 237



MACHINERY, October, 1957—129



## "BUFFALO" CAN SPEED UP YOUR TOUGHEST

**COMPLEX HIGH-CAPACITY DRILLING, TAPPING OPERATIONS FLOW SMOOTHLY** — with a line of "Buffalo" No. 22 Drills like that above, turning out liquid meters at a high rate. Each operator handles 2 to 4 setups without stopping for adjustments, and each spindle has both power and sensitive feed. Note that

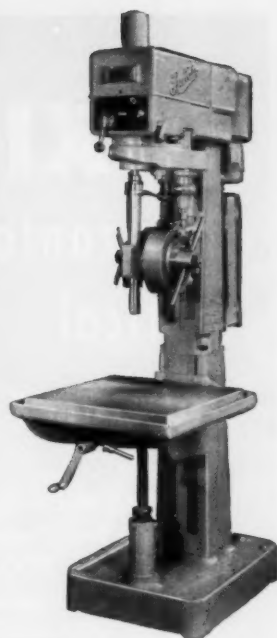
all controls are easily reached — these giant 96"-high machines handle as easily as small sensitive drills, yet have  $1\frac{1}{4}$ " capacity in mild steel! Hand-scraped ways, husky 5.5" dia. columns, precision 6-spline spindles over 1" in least diameter. Write for Bulletin 2989G and see how these quality machines could be increasing your output and cutting costs.



DRILLING • PUNCHING • SHEARING • BENDING



**CHANGE DRILLING SPEEDS WITHOUT TIME-OUTS** and enjoy the smoothest operation in drill history with the great new "RPMster"! Its gearless drive provides instant, infinite spindle speed changes between 100 to 550 RPM's and 500 to 3000 RPM's. Here is the really versatile machine for uninterrupted work flow through its entire capacity range of drilling, reaming and tapping. And the "RPMster" offers every other feature for accuracy and convenience — "Buffalo" all-gear power feed, back gearing, easy-action table-raising screw, hand scraped ways and vibration-free operation. Write for details and a demonstration of the "Q" Factor\* built into this precision machine.



**MULTIPLE OPERATIONS — HEAVY PRODUCTION UP TO 1"**—"Buffalo" No. 18 Drills are offered in 19 models to fit your operation exactly — everything from single spindle bench or floor models to 6-spindle units for multiple operations on fixed setups — plus a full range of accessories. These are powerful, rigidly built machines, designed for easy adjustment and operation. Their 6-spline alloy steel spindles turn smoothly and without deflection on two sets of precision ball bearings. Write for Bulletin 3123.

*\*The "Q" factor — the built-in Quality which provides trouble-free satisfaction and long life.*



## DRILLING OPERATIONS

### SMALL JOBS UP TO 1/2"—OR CONTINUOUS PRODUCTION

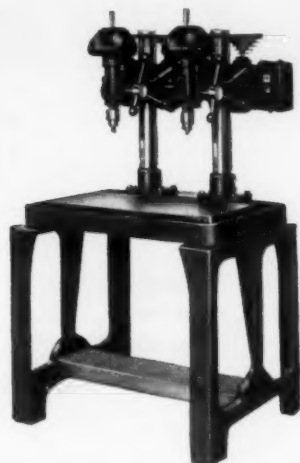
— The "Buffalo" No. 15 Drill has the adaptability and the stamina for both! Choice of 15 single and multiple spindle models and arrangements, full selection of accessories. Quick, handy adjustments and fatigue-free operation. A full-time production machine, too, with its 6-spline ball bearing spindle and overall husky construction. Write for Bulletin 2963G — there's a "15" tailor-made for your operation!

## BUFFALO FORGE COMPANY

440 BROADWAY

BUFFALO, N. Y.

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.





# DIXI 60

## horizontal optical jig borer

The **ONLY** Horizontal  
Jig Borer Built Today!  
Combines the **ACCURACY**  
of the Vertical Spindle  
With the **VERSATILITY** of  
the Horizontal Spindle

### ACCURATE:

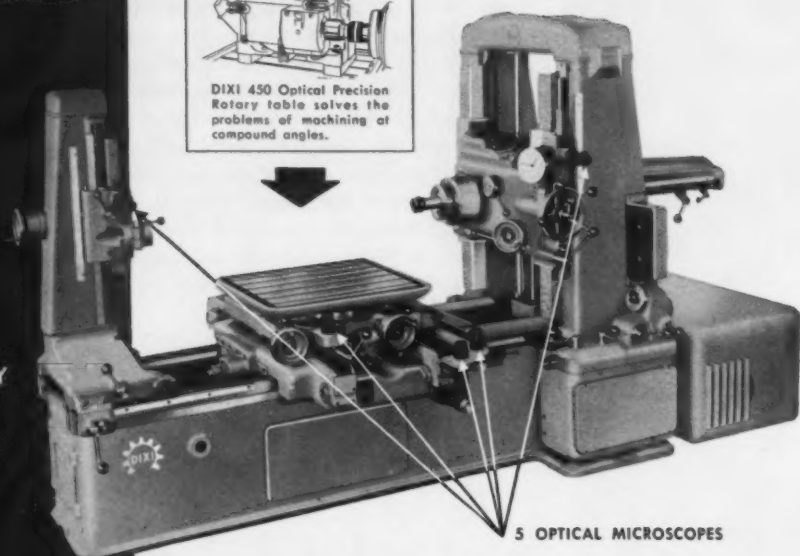
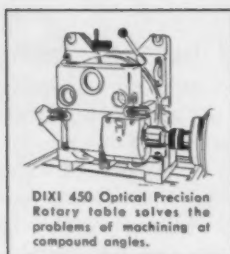
Optical settings provide an overall  
accuracy of .0002.

### VERSATILE:

Optical settings for operations in all  
planes and compound angles . . . equally  
suitable for tooling, short-run or  
production work . . . permits JIGLESS  
boring, facing, milling and drilling.

### PRODUCTIVE:

Saves time, labor & costs . . .  
Unclamping, positioning, fine adjustment,  
reclamping and rechecking can be  
made in less than 10 seconds.



5 OPTICAL MICROSCOPES

The DIXI Optical Reversing Process assures perfect alignment as well as round, taper-free holes. In work pieces with line bores on opposite sides, this is obtained by optically indexing the built-in rotary table 180°, locking the spindle feed and using the hydraulic table in-feed instead. Electrical infinitely variable speed spindle drive; infinitely variable hydraulic feeds; special features eliminate effect of spindle over hang on accuracy.

Made in Switzerland

All measurements in inches

- Guaranteed service by factory trained staff
- Engineering staff available for consultation
- Spare Parts in New York stock
- Your operators trained

DIXI 60 now in wide use in leading aircraft and manufacturing plants throughout the United States.

THIS VERSATILE MACHINE IN OPERATION at our New York, and other conveniently located Demonstration Centers.

Our Headquarters  
in New York City



## M. B. I.

### export & import Ltd.

A Division of Machinery Builders, Inc.

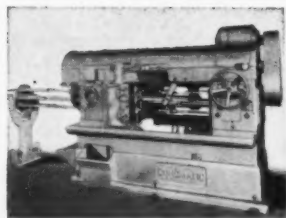
475 Grand Concourse, Bronx 51, New York

"Over 25 years experience in designing & building machinery"

If you haven't read this important booklet, your production line may be operating at less than peak efficiency. Your operations may be beating competition with HSS today, but you will likely need carbide tooling to be the leader tomorrow.



Write for your free copy of this important booklet today!



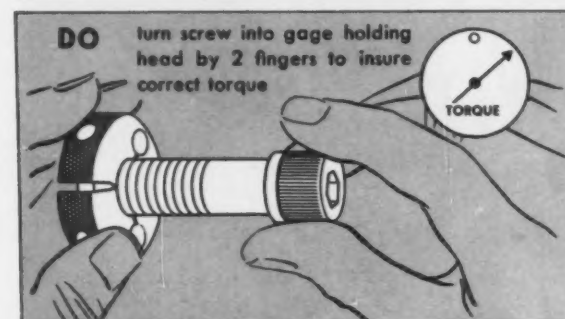
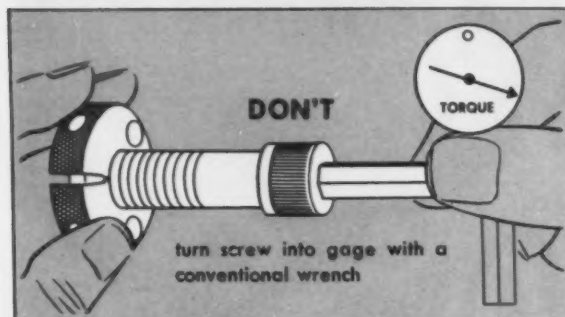
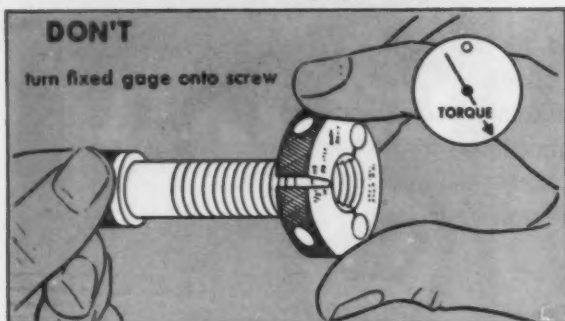
# Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC., WINDSOR, VT., U. S. A.

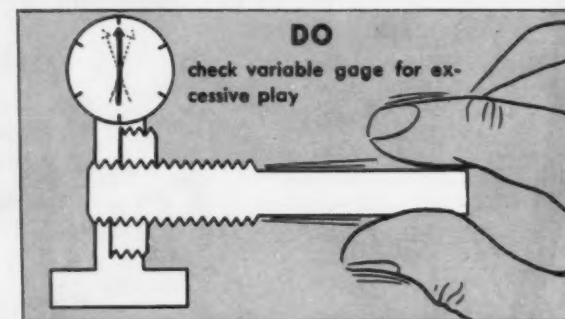
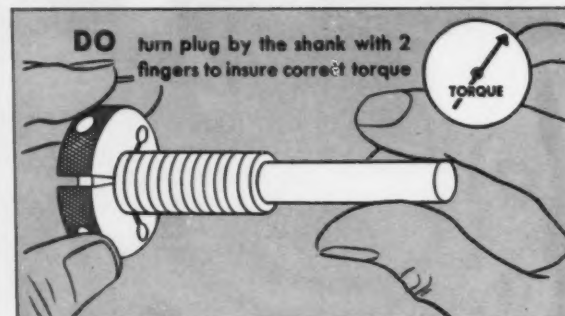
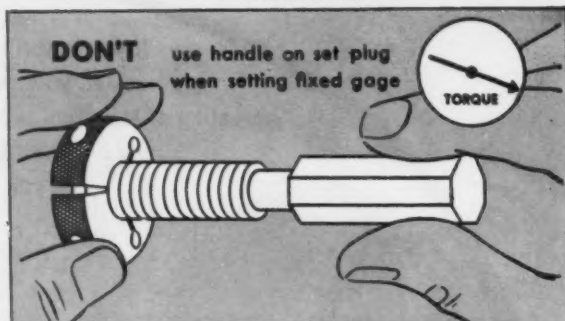
For more information fill in page number on Inquiry Card, on page 237

MACHINERY, October, 1957—133

#### When measuring high limits



#### When gaging gages



These illustrations from new SPS booklet show some of the do's and don'ts of gaging precision threads.

## 3A threads: what they are; how to gage them — new SPS booklet tells all

Threads made to Class 3A fit are the most precise in general use in industry. But you do not always get the 3A precision you specify. Because of many different gaging techniques that yield varying results, screws with threads well outside the Class 3A tolerance limits often pass inspection.

SPS has prepared a new booklet on this subject. It explains clearly what Class 3A threads are and the pros and cons involved in the widely varying gaging techniques in use today. It reviews the gaging of high and low limits of 3A threads, sampling techniques, and even the methods of gaging gages.

All standard UNBRAKO socket screw products fall within specified tolerance limits *no matter what method is used to gage them*. Leading industrial distributors carry complete stocks. Unbrako Socket Screw Division, STANDARD PRESSED STEEL CO., Jenkintown 19, Pa.



We also manufacture precision titanium fasteners. Write for free booklet.

Form 2239, "Class 3A Threads: what they are; how to gage them." 16 pages, with many illustrations. Write for free copy today.

UNBRAKO

SOCKET SCREW DIVISION

STANDARD PRESSED STEEL CO.

**SPS**

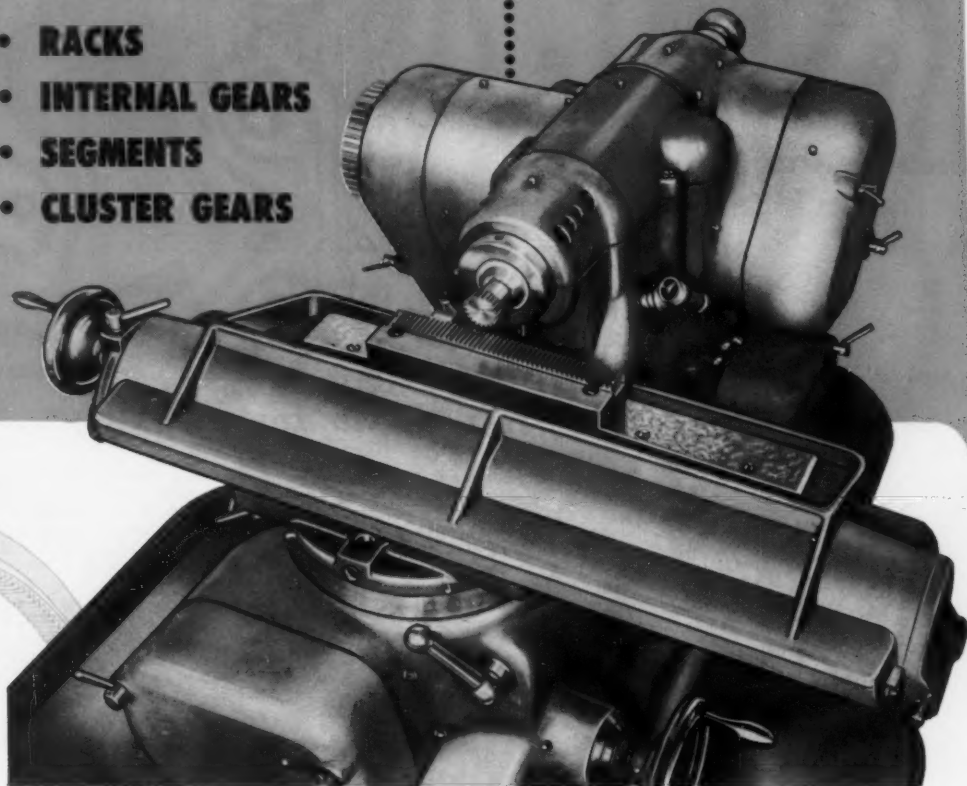
JENKINTOWN PENNSYLVANIA

# MIKRON

- ...for • **RACKS**  
• **INTERNAL GEARS**  
• **SEGMENTS**  
• **CLUSTER GEARS**

*Fine Pitch*

**RACK & GEAR CUTTER  
No. 134**



**A** **NOTHER** machine in the MIKRON line—  
*Controlled Accuracy, High Finish, Ease  
of Set-Up.* The precision cutter shapes as it gen-  
erates tooth forms. The work meets your most  
exacting specifications and standards. Gear pro-  
duction requiring a shaping operation will be  
ideally performed with the MIKRON No. 134.

## **WORK PIECE CAPACITY**

**RACKS**  
(Straight or Skew)  
to 36" long x 1" wide.  
**SEGMENTS & CLUSTERS**  
to 3 1/8" dia. x 1" wide.  
**INTERNAL GEARS**  
to 4" dia. x 1" wide.

# **RUSSELL, HOLBROOK & HENDERSON, INC.**

292 Madison Avenue, New York 17, N. Y.



# DROODLES

by ROGER PRICE



Bench Model BC-7C



Floor Model FC-30



Floor Model FC-14

## "LEFT-HANDED MONKEY WENCH"

Her name was Yvonne, and I won her in a crap game in Greenwich Village. She was a winsome little thing, and at first we got along famously. She was a good housekeeper, and her cooking wasn't half bad, if you like a steady diet of banana fritters, banana bread and banana pudding. Some people would call Yvonne talented, I suppose, but frankly, she had lots of faults, too, like singing off-key, and lacing my beef stew with absinthe. Finally, when she started nagging me and sneering at my sparkling witticisms, I got fed up and gave her to my worst enemy. Now they're both on TV, making a fortune, and I'm back doing my own typing again.

Without monkeying around any further, I'd like to give you a few facts on Jones & Lamson Optical Comparators. These precision-built instruments are on the job throughout industry, keeping quality control high by rapidly and accurately measuring and inspecting all sorts of parts and objects. The J & L Comparator's speed, accuracy (to .0001") and ease of operation make it equally valuable for both production line and small-lot work. Investigate how the J & L Comparator can help keep production quality high, and scrap low, in *your* plant. Available in eleven bench and floor models. For complete information, write Dept. 710 *today*.

## JONES & LAMSON OPTICAL COMPARATORS On the Job . . .



### at New Milford Carbide Tool Co., Hackensack, N.J.

J & L Comparators speedily and accurately check angles, radii, contours and linear dimensions of precision carbide and H.S.S. form tools, thereby assuring conformance with specific customer requirements.

### at American Coldset Co., Paterson, N. J.

The rapid, precise inspection of special and standard industrial diamonds, by means of J & L Optical Comparators, safeguards the maintenance of high quality standards.



"The originator of machine tool standards in optical inspection"

# JONES & LAMSON

JONES & LAMSON MACHINE COMPANY, Dept. 710, 512 Clinton Street, Springfield, Vt., U. S. A.

Please send me Comparator Catalog 402-C, which describes the complete line of J&L Optical Comparators.

name \_\_\_\_\_ title \_\_\_\_\_

street \_\_\_\_\_

company \_\_\_\_\_

city \_\_\_\_\_ zone \_\_\_\_\_ state \_\_\_\_\_

*Since the days of the bangboard—*



*Double Diamond Gears have been extensively used in farm machinery. There can only be one reason: their ability to withstand the rigors to which farm machinery is exposed. If you are looking for Double Diamond quality why not discuss your application with one of our gear engineers? Write.*



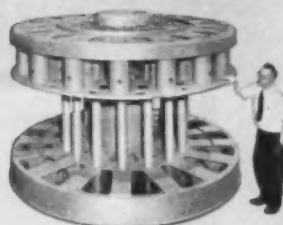
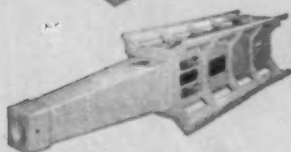
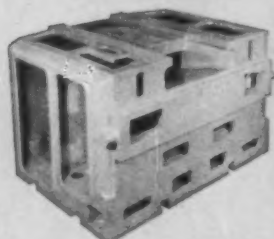
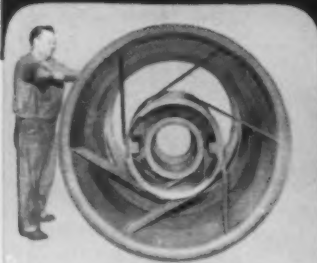
**EATON**

**AUTOMOTIVE GEAR DIVISION  
MANUFACTURING COMPANY  
RICHMOND, INDIANA**



GEARS FOR AUTOMOTIVE, FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS  
GEAR-MAKERS TO LEADING MANUFACTURERS





# Steel-Weld FABRICATION



Use **WELDED STEEL**  
for Greater Strength  
with Less Weight!



The 100-ton weldment illustrated above is the base unit of a housing for a 300,000 kw Steam Turbine. It is another example of Mahon craftsmanship and Mahon's ability to serve you. This heavy weldment, and those appearing at the left, are typical of the thousands of Steel-Weld Fabricated Parts and Assemblies produced by Mahon each year for manufacturers of processing machinery, machine tools, and other types of heavy mechanical equipment. If you are not now taking full advantage of the economies offered by welded steel components in your product, you should give the matter serious thought. In the design of almost any type of heavy machinery, or mechanical engineering project, there are parts and sub-assemblies that can be produced more economically, more satisfactorily, and in less time, in welded steel. In weldments you get greater strength with less weight—plus the additional advantages of greater rigidity and 100% predictability. When you consider weldments, you will want to discuss your requirements with Mahon engineers, because, in the Mahon organization you will find a unique source for weldments or welded steel in any form . . . a fully responsible source with complete facilities for design engineering, fabricating, machining and assembling . . . a source where design skill is backed up by craftsmanship which assures you a finer appearing product embodying every advantage of Steel-Weld Fabrication. See Sweet's Product Design File for information, or have a Mahon sales engineer call at your convenience.

**THE R. C. MAHON COMPANY** • Detroit 34, Michigan  
Sales-Engineering Offices in Detroit, New York and Chicago

**Engineers and Fabricators of Steel in Any Form for Any Purpose**

# MAHON



1



2



3



4



5

people  
buy  
Scott Wipers  
for  
many  
reasons:



Mr. Orville Barr, Ekco's Chicago Plant Manager, likes soft, absorbent, 2-ply paper Scott Wipers for all clean-up and maintenance wiping. They're Perf-embossed®, a special process which makes them ideal for wiping (1) planers, (2) rolls, (3) punch presses, (4) forming presses, (5) milling machines.

## At EKCO, Scott Wipers cut wiping costs 18%

Ekco Products Company's Chicago plant employs 1,400 people making about 1,300 nationally famous kitchen items. Tired of excessive costs with cloth wipers—pilferage, sorting, counting, storing, laundering and dispensing—Ekco switched to Scott Wipers 3 years ago. Besides helping to protect dies valued at \$3,000 to \$12,000 each, Scott Wipers have saved Ekco 18% to 20% annually in wiping costs.



*For Ekco case history—complete facts and figures—phone your Scott Distributor . . . listed in the Yellow Pages under "Paper Towels." Or write Scott Paper Co., Dept. M-710, Chester, Penna.*

Maker of the famous Scott paper products you use in your home.  
See "Father Knows Best" and "The Gisele MacKenzie Show" on NBC-TV.





how to keep costs down  
... profit margins up!

**ALLEN Engineers will show you how you can save time and money by using standard\* ALLEN Hex-Socket Cap and Set Screws instead of specials.**

Let's get this straight right away... if your product design **MUST** have special cap or set screws, then ALLEN's the place to come for them.

But our engineers have found, from a good many years of experience, that designs frequently call for *special* hex-socket cap and set screws that are only slightly "off-standard." These specials take longer to get, cost more.

Allen engineers can probably save you both time and money by working with you on ways to use *standard* Allen Hex-Socket Cap and Set Screws, where specials may seem to be necessary. Just send blue prints, or good descriptions, of your product designs to our Engineering Department, or talk with your Allen Field Representative.

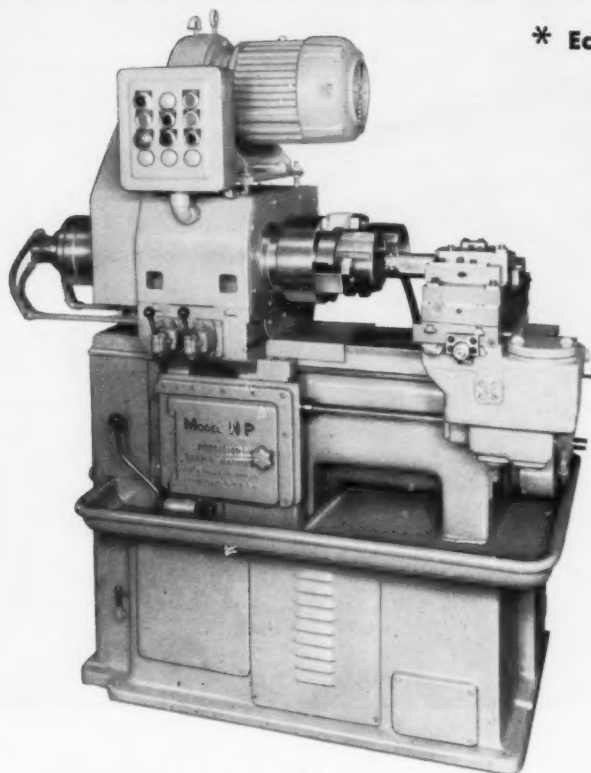
**\*ALLEN manufactures 1457 standard items**

*Stocked and sold by leading industrial distributors everywhere*

**ALLEN** MANUFACTURING COMPANY  
Hartford 2, Connecticut, U. S. A.



# NEW MACHINE OF THE MONTH NEW ECONOMY\* IN PRECISION BORING



\* Economy in initial investment

Economy in machining costs

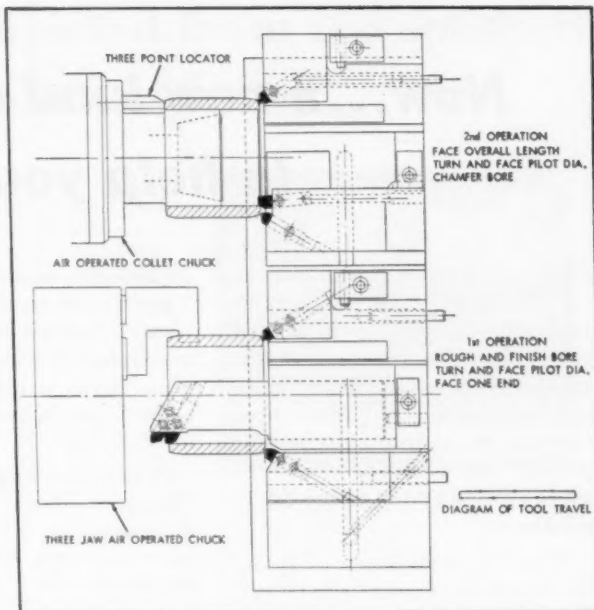
Economy in maintenance costs

Economy in change-over time

The new Seneca Falls Model "NP" Precision Boring Machine is a top quality, reasonably priced, mechanically operated machine available with either one or two precision spindles mounted independently on a fixed bridge. Either the work or the tools can be rotated on the spindles. The patented "Quick Change-over Mechanism" permits variations in carriage stroke, rapid traverse and feed cycle without changing or purchasing additional cams and reduces average changeover time to less than thirty minutes. The design of the headstock bridge permits the installation of other makes of standardized boring heads.

Let our engineering staff help solve your precision machining problems.

The two-spindle machine illustrated above is equipped for boring, facing and rabbeting both ends of field rings in a single machine cycle. When the operator removes a finished piece from the rear chuck, he transfers a semi-finished piece from the front chuck and replaces it with a rough piece. When the starting button is pressed, the tools move forward in rapid traverse to cutting position, automatically shift to cutting feed, and finally return to starting position in rapid traverse. The entire operation is automatic. The field rings are 4-1/2" in diameter and a production of 60 pieces per hour at 100% efficiency is easily maintained. Tooling arrangement is illustrated opposite.

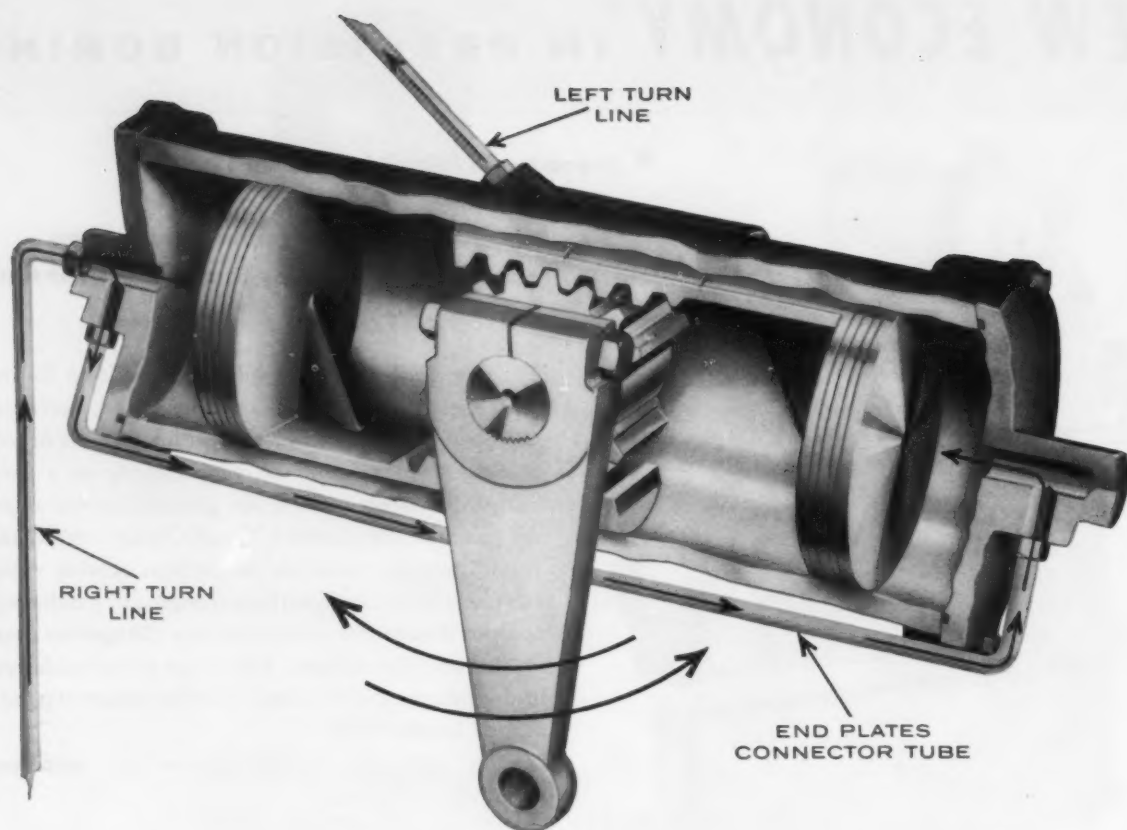


ENGINEERED FOR PROFIT

**SENECA FALLS MACHINE CO.**

SENECA FALLS, NEW YORK

Lo-swing Lathes and Seneca Falls Machine Tools, Automation and Electronics



## Now...a new kind of Power Cylinder to help you cut costs

**T**HE new rotary motion Thompson Power Cylinder provides versatility of application, ease of installation, compactness and efficiency certain to solve many design and manufacturing problems. These features can cut your costs by simplifying production. It is now in use in a leading make of heavy-duty trucks.

Requiring a minimum of space, the Thompson Power Cylinder can be operated wherever hydraulic or pneumatic pressure is available. Operating from 600-1000 psi, at 700 psi it delivers approximately

26,000 inch pounds torque output. These parameters can be varied to obtain a custom installation. Also, over-running clutches, sprockets, gears, chains, etc., are easily adapted to the output shaft to further increase its versatility.

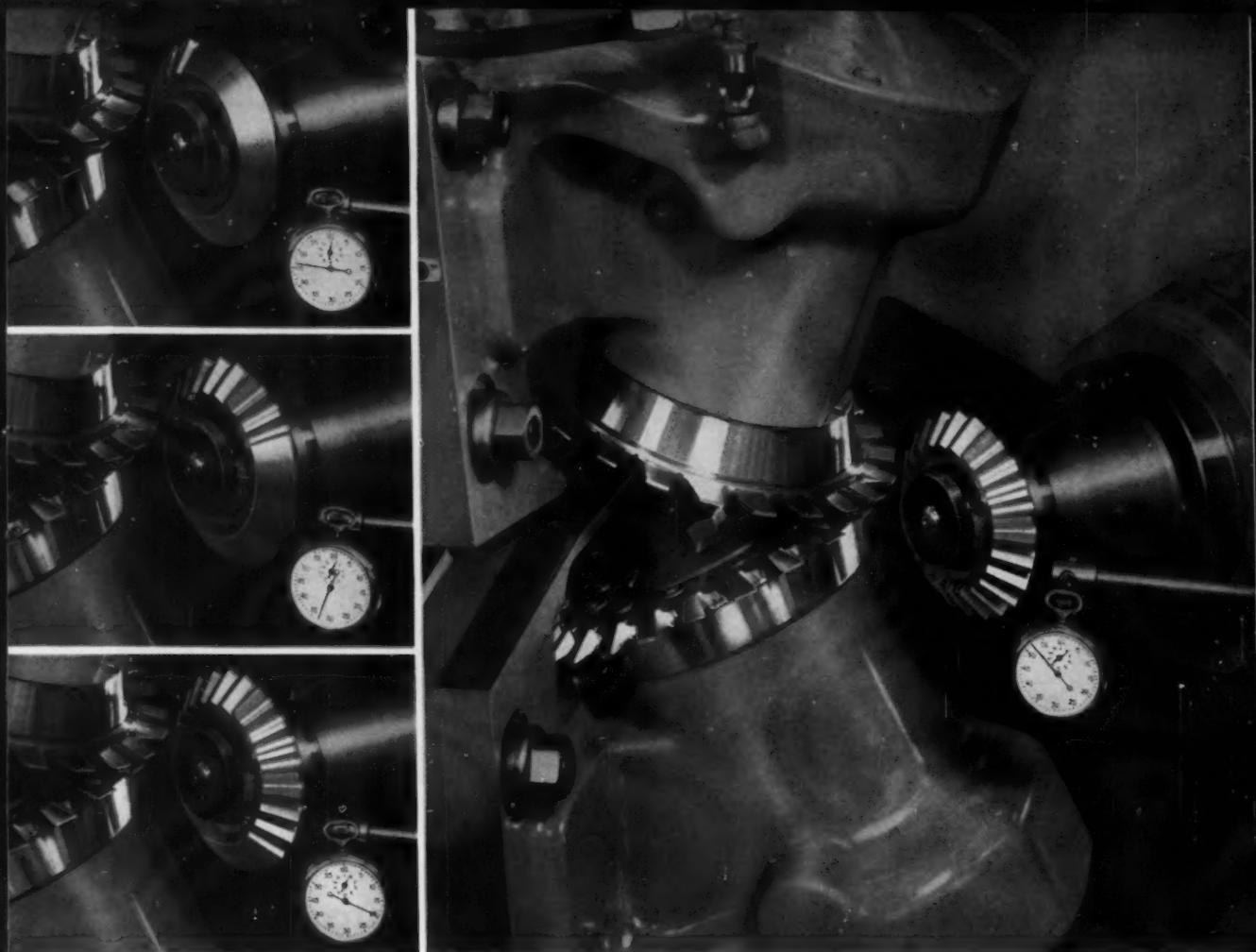
Precision engineered, the Thompson Power Cylinder is as dependable as it is versatile. You can count on a long, continuous, trouble-free life.

To learn more how the Thompson Power Cylinder can save you money in design, manufacture and installation costs, write for our free book-

let. Described are many of its diverse uses and additional benefits. Mail to Thompson Products, Inc., Michigan Division, 34201 Van Dyke Avenue, Warren, Michigan.

You can count on  
**Thompson  
Products**

Michigan Division:  
Warren and Portland



## 3 minutes-52 seconds, completed from the solid

*You can cut gears 5 times faster!*

You can increase production by as much as 400%.

Your exact gain may vary with different gears, but in most cases this new generator will complete five gears in the time earlier models cut just one. The illustrations above show a 6 DP, 25 tooth,  $\frac{7}{8}$ " face width, straight bevel gear completed from the solid blank.

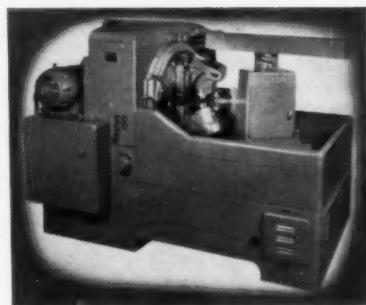
The No. 104 Straight Bevel Coniflex\* Generator completes each tooth in one rapid operation. A pair of

\*Coniflex® straight bevel gears with localized tooth bearings.

multi-blade disc-type cutters combined with a cam-controlled machine cycle insures high efficiency, fine finish and maximum cutter life.

Easy to set up, the No. 104 has a wide range of capacity. You'll get the same excellent results for both small quantity jobbing work and volume production.

To discover other savings you can make with this remarkable Gleason Generator, simply write for descriptive bulletin.



*The Gleason No. 104 Straight Bevel Coniflex Generator cuts gears up to 8½" diameter, 4½" cone distance and 1⅝" face width, from 20 to 3 DP, ratios up to 10 to 1.*



# GLEASON WORKS

*Builders of bevel gear machinery for over 90 years*

1000 UNIVERSITY AVE., ROCHESTER 3, N. Y.





Automatic in operation at Clinton Machine Co. Texaco-lubricated machines have helped turn out a total of over 6,000,000 engines.

## Texaco Cleartex gives Clinton longer tool life, more pieces per grind

These are the fine results which Clinton is achieving with *Texaco Cleartex Oil B* in their automatics.

**Machine:** Gridley  
**Part:** Valve seat insert  
**Metal:** Ampcoloy 45  
 72 hours or 20,000 pieces per tool grind

**Machine:** Brown & Sharpe  
**Part:** Wrist pin  
**Metal:** B 1113  
 8 hours or 3,000 pieces per tool grind

**Machine:** Fellows Gear Shaper  
**Part:** Spur gear (2¼" blank)  
**Metal:** Cast steel  
 1,500 to 2,000 pieces per tool grind

To produce its engine parts, the Clinton Machine Co., Maquoketa, Iowa, uses a sizable battery of automatics for its machining. On the recommendation of a Texaco Lubrication Engineer, they are using *Texaco Cleartex Oil B* with, as their Superintendent reports, "excellent results". (Check the box at the left).

*Texaco Cleartex Oil* is used by many manufacturers as a tri-purpose oil—cutting, lubricating, hydraulic—in their automatics. The results include long tool life, excellent rust prevention, non-dilution of cutting oil, and full protection for machines.

There is a full line of *Texaco Cutting, Grinding and Soluble Oils* to help you do all your metal working better, at lower cost. Let a Texaco Lubrication Engineer suggest the best ones for you. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.



# TEXACO

**CUTTING, GRINDING,  
 SOLUBLE AND  
 HYDRAULIC OILS**

- Autumn Tax Forecast
- Autumn Budget
- Autumn Inflation
- Autumn Gleanings



## Keeping up with Washington

Loring F. Overman

FROM many angles, Washington's autumn promises somewhat less than a bountiful harvest for members of the machinery industries. With government departments and agencies ordered to "trim, reconsider, or postpone" all but the most essential projects, purse strings were being pulled considerably tighter than usual.

Extremely favorable, however, is the over-all tax outlook. For the first time in decades, the House Ways and Means Committee indicates an interest in a long look at the tax picture. The Committee announced plans to conduct public hearings on the need for tax revision, starting January 7, 1958, and continuing for many weeks.

There are more than 1500 tax reform proposals before Congress. The hearings are intended to permit discussion of widely varied proposals for a new and more equitable tax structure. Applications to appear before the committee will be accepted until December 2, 1957. Requests should be made in writing to Clerk, House Ways and Means Committee, 1102 New House Office Building, Washington 25, D. C.

Another favorable action, from the standpoint of those seeking tax rate reductions (and who isn't?), was the introduction of bill H.R. 9119. The sponsor is Representative Herlong (D-Fla.), a member of the House Ways and Means Committee. The tax reform measure is identical to one introduced previously by Representative Sadlack (R-Conn.). This dual sponsorship gives the proposals a bipartisan flavor.

### Autumn Budget

The national defense budget is undergoing unprecedented pruning. Cutbacks, stretch-outs, consolidations, and postponements are being employed to reduce the cash outlay for the balance of fiscal 1957. The Defense Department has been ordered to chop at least \$2,600,000,000 from the \$40,200,000,000 annual rate of spending in effect during the six months ending August 15, 1958.

Another device intended to postpone payments totaling \$260,000,000 was a proposal to reduce by 5 per cent the progress payments made to contractors for work in process. Plans are under way to temper this method of payment deferral. Opponents are pointing out that withholding in-process payments merely requires the contractor to borrow working capital and to pass the interest charges along to the Defense Department as an item of increased cost. Cuts in the foreign aid program—also involving armaments and the machinery to produce

them—have provided another sobering statistic in the heavy equipment outlook for the months ahead. The long-range view is that increasing population and generally expanding industry and commerce will provide the machinery industry with another springboard for future expansion.

### Autumn Inflation

Curtailed defense budgets was a part of a brake-inflation movement which had Washington planners seriously concerned as summer ended. Both the House Banking and Currency Committee and the Senate Finance Committee were holding consultations with the nation's fiscal and monetary diagnosticians. Conclusion: there's an urgent need to apply gentle but positive braking action to an accelerating trend toward inflation.

Considered as extremely important was the Federal Reserve Board's action in increasing the rediscount rate (to 3 1/2 per cent from 3 per cent) at most Federal Reserve Banks. The increased rediscount rate—the rate Federal Reserve banks charge member banks for loans—confirms continuation of the Administration's "tight money policy."

### Autumn Gleanings

- A new machine tool directive (DOD 4215.9) revises procedures for recording and utilizing idle production equipment included in the department's Production Equipment Redistribution Inventory. Although similar to the policy outlined in February of last year, a major change permits allocation of idle tools to specific package plants or stand-by lines. In the past, such idle tools could be withdrawn only for actual use on military contracts or in military establishments when required for current production.

- The new directive also spotlights the meaning of the term, "essential military program of high urgency." The classification, according to the new directive, involves "those programs which are contained in the 'S' category of the current Master Urgency List."

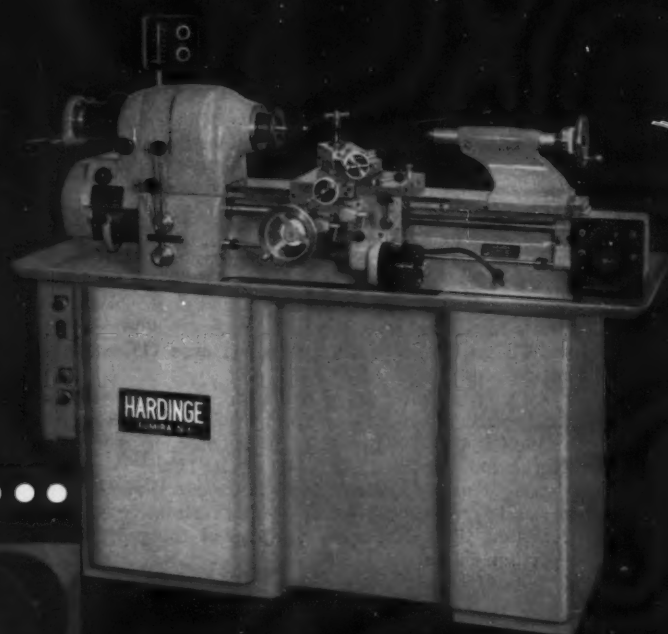
- Each military department is required to furnish an analysis of its package plants, including active base packages and stand-by lines, within 180 days. Purpose: to determine the need for retention as entities for mobilization use. Also required of the Departments are reports of equipment items becoming idle in the future.



# EASY READING HARDINGE

**BLACK** AND  
**WHITE** DIALS

MEAN  
INCREASED  
PRODUCTION ...



HARDINGE developed these fast setting easy reading black and white dials — they assure maximum accuracy with high production.

Pioneered with the Hardinge High Speed Precision Tool Room Lathe model HLV shown here — Hardinge black and white dials are now standard equipment at no extra cost on all of our tool room and production machines.

Invest in Hardinge equipment for product improvement and increased production. Ask for bulletin on our tool room and production machines.

**HARDINGE BROTHERS, INC.**  
ELMIRA, N. Y.

## *The Key to National Well-Being*

FIFTY years ago it was common practice for the working force of shops and mills to labor sixty to seventy hours a week—without any over-time pay. Today the average employe works only forty hours a week.

During this half-century our standard of living has attained a plateau that would have been inconceivable in 1900. Real wages of industrial workers have more than doubled since the beginning of the First World War.

What has made possible this tremendous change in our nation's economy? Greater output per man-hour is the answer. It is more than double the output of forty years ago. Twenty-five million new jobs have come into existence—jobs resulting from the demands of a larger population and from the introduction of labor-saving and recreation-providing appliances that did not exist even two decades ago.

Productivity in the metalworking industry has been catapulted mainly through the development of machine tools and other fabricating machinery to their high level of design, advances in cutting metals, and the discovery of new ferrous and non-ferrous alloys.

In 1940 American industry had less than one million machine tools, whereas today nearly two million are installed in our fac-

tories. Vastly different are they in construction! Standard machines have been redesigned to provide the power and rigidity necessary for utilizing to the fullest extent the metal-cutting potentialities of carbide cutters. Machines are built more accurately in order that they can produce parts to the extremely close tolerances being specified in this Jet Age.

Tracer-controlled machines enable the duplication of production parts with semi-skilled help. Tape-controlled machines are rapidly finding application for work involving complex machine movements. The most revolutionary development in recent years has, of course, been the transfer type of machine tool, bringing automation to metal-working plants.

Other nations have been endowed as liberally as we, with the raw materials of prosperity. They have not progressed to our extent mainly because of their failure to recognize the importance of constantly increasing the man-hour output of industry.

Productivity is the key to prosperity. If our standard of living is to reach increasingly higher levels, the productivity of our factories must keep apace. This can be done only by using the latest types of manufacturing equipment.

*Charles O. Herb*

EDITOR





## Tighten steel inventory control with Ryerson immediate service

No need to miss your steel inventory targets. You can make more conservative estimates of your requirements, with greater assurance of safety, when you rely on Ryerson.

Every kind of steel, every shape and size is available from the world's largest stocks—ready for shipment on the schedule you set . . . on the day you select.

Ryerson's large staff of experienced steel men is ready to help with steel selection, application suggestions, and scheduling. They're as close to you as your phone.

### GET WHAT YOU WANT WHERE YOU WANT IT—AND ON TIME!

1. **Steel from stock.** Carbon steels, alloy steels, stainless—bars, structurals, plates, sheets, strip and tubing.
2. **Fabricated construction steel.** Re-bars and accessories, spirals, wire fabric, bar joists, structural steels.
3. **Aluminum from stock.** Sheets, coils, bars, plates, tubing, architectural shapes, building products—available from most Ryerson plants.
4. **Plastics from stock.** PVC pipe, valves and fittings, sheets and rods, rigid Kralastic pipe, flexible polyethylene pipe and tubing.
5. **Flame-cut steel shapes.** In carbon, alloy or stainless steel. A single piece or thousands.
6. **Machinery and tools.** The broadest line of metalworking equipment available from a single source.

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148—MACHINERY, October, 1957

For more information fill in page number on Inquiry Card, on page 237



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## MACHINING HIGH-TEMPERATURE ALLOYS

**The heat-resistant alloys presented combine high-temperature strength and resistance to oxidation. Due to their high alloy content, however, they are difficult to work and must be machined at reduced cutting speeds.**

**H**IGH-TEMPERATURE alloys, sometimes referred to as superalloys, are being depended on more and more to meet the challenge of heat. They must retain their strength characteristics while withstanding continuous operating temperatures in excess of 1200 degrees F. Such severe applications are found in modern jet power plants and high-speed aircraft, as well as in the various missiles now being produced.

Power requirements for turning these alloys are high—their shear strength is nearly double that encountered in machining medium-carbon alloy steels. Their microstructure normally consists of a

solid solution of complex carbides dispersed in an austenitic matrix. The alloys tend to work-harden when machined, and stress-relieving is often required after roughing operations. High-carbon and cobalt-base alloys are abrasive, often requiring machining in the solution-treated condition.

### *High-Temperature Alloys Fall into Four Classifications*

Although their chemical compositions vary greatly, the many high-temperature alloys can be classified into four general groups. The first and

**Table 1. Composition and Machinability Ratings of Austenitic Alloys**

Alloy	C	Cr	Ni	Mo	Co	W	Ti	Machinability†
16-25-6 .....	0.10	16.0	25.0	6.00	....	....	....	31
A-286* .....	0.08	14.7	25.5	1.25	....	....	2.10	27
Discaloy .....	0.04	13.5	26.0	3.00	....	....	1.60	25
Refractaloy 26* ..	0.05	18.0	37.0	3.00	20.0	....	2.80	20
N-155 .....	0.15	21.0	20.0	3.00	20.0	2.5	....	15
M-308* .....	0.08	13.5	32.5	4.00	....	....	2.15	20
19-9 DL .....	0.30	19.2	9.0	1.50	....	....	....	40
S-588 .....	0.40	20.0	20.0	4.00	....	4.0	4.00-Nb	12

\* Age-hardenable—normally machined in solution-treated form.

† Machinability ratings are based on the materials' inherent strength and toughness. When determining cutting speeds, the abrasiveness of the alloy must be considered.

**Table 2. Speeds and Feeds Recommended for Use with Austenitic Alloys**

Alloy	Roughing		Finishing	
	Speed, Surface Feet per Minute	Feed, Inch per Revolution	Speed, Surface Feet per Minute	Feed, Inch per Revolution
16-25-6 .....	120-165	0.010-0.017	135-200	0.008-0.012
A-286 .....	120-155	0.010-0.017	135-180	0.006-0.011
Discaloy .....	100-135	0.010-0.014	120-165	0.006-0.011
Refractaloy 26 .....	67-105	0.008-0.013	75-120	0.006-0.010
N-155 .....	50-72	0.008-0.013	67-90	0.006-0.010
M-308 .....	67-105	0.010-0.014	75-120	0.005-0.009
19-9 DL .....	155-190	0.010-0.017	170-220	0.008-0.012
S-588 .....	40-67	0.008-0.012	45-75	0.005-0.009

**Table 3. Composition and Machinability Ratings of Age-Hardenable Alloys**

Alloy	C	Ni	Cu	Cr	Co	Ti	Al	Other	Machinability†
Inconel .....	0.04	76	...	15.8	....	....	....	....	30
Incoloy 901 .....	0.04	45	...	13.0	....	2.50	....	33.0-Fe	20
Nimonic 75 .....	0.10	77	...	20.5	....	0.35	0.15	....	17
Inconel X .....	0.04	73	...	15.0	....	2.55	0.80	....	15
Nimonic 80 .....	0.04	75	...	21.0	....	2.50	0.60	....	12
Hastelloy B* .....	0.10	64	...	....	....	....	....	28.0-Mo.	12
Nimonic 90 .....	0.05	57	...	20.5	17.0	2.60	1.65	....	10
Hastelloy C* .....	0.15	55	...	16.0	....	....	1.00	17.0-Mo	10
Udimet 500 .....	0.10	53	...	17.5	16.5	....	....	4.0-Mo	9
Inconel 700 .....	0.10	46	...	15.0	29.0	2.00	3.00	3.0-Mo	8
K-42-B .....	0.05	42	...	18.0	22.0	2.00	0.60	....	8
713* .....	0.13	75	...	12.0	....	0.60	6.00	4.5-Mo	6

\* Cast Alloy

† Machinability ratings are based on the materials' inherent strength and toughness. When determining cutting speeds, the abrasiveness of the alloy must be considered.

**Machining a high-nickel alloy bulkhead for a guided missile to a tolerance of plus 0.001 minus 0.000 inch at the Diversy Engineering Co. A brazed carbide tool is used on a 20-inch, air-gage tracer-controlled lathe.**

most common of these are the **ferritic** (straight chromium and chromium-nickel) corrosion-resistant steels. They represent the heat-resistant alloys having the highest degree of machinability. Because the characteristics of these 300 and 400 series steels are well known, and because their resistance to elevated temperatures falls at the lower extremity of the scale, they will not be explored any further.

**Austenitic alloys** comprise the second group. Included is a wide range of chromium-nickel-molybdenum alloys. The composition and machinability of the different materials can be noted by referring to Table 1. They are slightly abrasive in character and have a shear strength ranging from 110,000 to 145,000 psi. Cutting speeds, using carbide turning tools, are normally held below 200 sfm (surface feet per minute). Recommended speeds and feeds for each of these alloys for both roughing and finishing cuts are given in Table 2.

Group three consists of **age-hardenable alloys**. Composition and machinability of this comparatively extensive category are given in Table 3. These nickel-base alloys are difficult to machine due to their inherent strength and work-hardening characteristics. They are normally machined in the solution-treated form, using speeds of 20 to 65 sfm. Feeds are usually held below 0.015 ipr (inch per revolution), and the depth of cut, below 0.093 inch. Heavy-duty lathes are required, as the alloys are abrasive and feed loads are exceptionally high. Complete cutting information is detailed in Table 4.

**Cobalt-base alloys** form the fourth group. These have excellent high-temperature properties but are virtually non-machinable due to their extreme abrasiveness. In Table 5 are listed the composition and low machinability rating of five such alloys. Only by using rigid machine tools, light chip loads, and low speeds can satisfactory machining be accomplished. By referring to Table 6 it can be seen that the highest cutting speed suggested for any of the five metals is 55 sfm for 2159 alloy.

### **General Turning Practice**

Austenitic alloys are normally turned with positive-rake carbide tools. The more abrasive cobalt alloys require the use of lighter chip loads and either zero- or negative-rake tools. These alloys work-harden severely ahead of the cutting edge.



When secondary or finishing cuts are necessary, they should be deep enough to place the cutting edge of the tool under the work-hardened surface left by the roughing operation.

Carbide tools used to turn high-temperature alloys show extreme wear due to both cutting-edge abrasion and surface cratering. To resist this wear as much as possible, the harder carbide grades should be used. Often, cutting speeds higher than those recommended are used, and shorter tool life is accepted to obtain a reasonable production rate.

Cutting speed is critical in its relation to the expected life of the tool. Variations from optimum cutting speeds due to changes in work diameter have an adverse effect on tool life. To achieve maximum tool performance, a constant surface-speed control is vital.

Lower cutting speeds should be used when turning scaled work. The work should be rigidly supported, and a positive feed maintained during the cut. No dwelling of the tool against the work should be allowed. Good surface finish is obtained using feed rates of 0.0035 to 0.006 ipr, and light depths of cut ranging from 0.010 to 0.015 inch. Feed rates below 0.0035 ipr tend to burnish the work surface.

Nickel-base alloys are normally turned using positive-rake tools. General practice requires the use of lower speeds and lighter chip loads than those employed for alloy steels. Heavy feed rates cause severe cold-working which adversely affects any secondary operations. Careful consideration



**Table 4. Speeds and Feeds Recommended for Use with Age-Hardenable Alloys**

Alloy	Roughing		Finishing	
	Speed, Surface Feet per Minute	Feed, Inch per Revolution	Speed, Surface Feet per Minute	Feed, Inch per Revolution
Inconel .....	80-125	0.010-0.017	100-150	0.004-0.010
Incoloy 901 .....	75-90	0.010-0.017	85-100	0.004-0.010
Nimonic 75 .....	65-80	0.010-0.017	75-90	0.004-0.010
Inconel X .....	50-65	0.010-0.017	55-70	0.004-0.010
Nimonic 80 .....	40-60	0.010-0.017	45-60	0.004-0.008
Hastelloy B .....	40-50	0.010-0.017	45-55	0.005-0.008
Nimonic 90 .....	35-45	0.009-0.015	40-50	0.005-0.008
Hastelloy C .....	35-45	0.009-0.015	40-55	0.005-0.008
Udimet 500 .....	30-40	0.008-0.013	35-40	0.003-0.008
Inconel 700 .....	30-35	0.008-0.013	30-35	0.003-0.008
K-42-B .....	.....	.....	20-30	0.003-0.008
713 .....	.....	.....	20-30	0.003-0.008

**Table 5. Composition and Machinability Ratings of Cobalt-Base Alloys**

Alloy	C	Cr	Ni	Mo	Co	W	Ti	Machinability†
S-816 .....	0.40	20.0	20.0	4.0	43.0	4.0	...	9
GE-1570 .....	0.20	20.0	29.0	...	37.5	7.0	4.2	9
HS-21° .....	0.25	27.0	3.0	5.0	62.0	...	...	6
2159 (HS-25) .....	0.12	20.0	10.0	...	51.0	15.0	...	12
HS-31° .....	0.50	24.5	10.0	...	55.0	7.5	...	6

° Cast Alloys

† Machinability ratings are based on the materials' inherent strength and toughness. When determining cutting speeds, the abrasiveness of the alloy must be considered.

**Table 6. Speeds and Feeds Recommended for Use with Cobalt-Base Alloys**

Alloy	Roughing		Finishing	
	Speed, Surface Feet per Minute	Feed, Inch per Revolution	Speed, Surface Feet per Minute	Feed, Inch per Revolution
S-816 .....	30-42	0.008-0.013	35-47	0.004-0.009
GE-1570 .....	30-42	0.008-0.013	35-47	0.004-0.009
HS-21 .....	25-35	0.009-0.012	30-40	0.005-0.008
2159 (HS-25) .....	35-55	0.010-0.015	45-55	0.006-0.010
HS-31 .....	25-35	0.009-0.012	30-40	0.005-0.008

**Table 7. Recommended Tool Grades and Geometry for Turning High-Temperature Alloys**

Alloy Type and Machining Condition	Tool Grade	Side Rake Angle, Degrees	Back Rake Angle, Degrees	Relief Angle, Degrees	Side Cutting-Edge Angle, Degrees	Remarks
Age-Hardenable and Austenitic						
Roughing .....	K2S°	6	0-3	6	15-30	Hone cutting edge (cratering plus abrasion)
Finishing .....	K7H°	6	0	6	0	
Cobalt Base .....	K6°	0	0	3-5	15-30	Abrasive wear
Intermittent Cuts .....	HSS	6	0	5	30	3/64-inch nose radius

° Or its equivalent.

**Table 8. Horsepower Required when Turning High-Temperature Alloys**

Alloy	Horsepower per Cubic Inch per Minute
16-25-6 .....	1.10
A-286 .....	1.20
S-816 .....	1.25
GE-1570 .....	1.30
Refractaloy .....	1.30
Inconel X .....	0.90
Nimonic 80 .....	1.10
Nimonic 90 .....	1.30
713 .....	1.06
Inconel 700 .....	1.40

should be given to the thermal treatment used prior to turning, as the machinability of nickel-base alloys varies greatly depending on whether they have been solution-treated or fully age-hardened.

Close tolerances can be held when machining complex shaped parts of high-temperature alloys by using single-point tooling on tracer-controlled lathes. The reduced tool pressure encountered in this type operation results in minimum distortion of the work-piece.

### Tooling Recommendations

High-temperature alloys are generally turned with tools having a positive back-rake angle of zero to 3 degrees, and a positive side-rake angle of 6 degrees. Negative-rake tools are effective only where additional edge strength is required to prevent tool breakage, such as when using a harder-than-normal grade of carbide. To reduce

the tendency to chatter, and to minimize work-hardening, the nose radius should be held below 1/32 inch. A large lead angle is recommended for roughing cuts.

The abrasive cobalt alloys are turned with the straight tungsten grades of carbide. When turning the austenitic and age-hardenable alloys, better tool life is obtained with the crater-resistant grades. In Table 7 are listed the recommended cutting material and tool geometry for the various types of high-temperature alloys. Because feed loads are high and a discontinuous chip is formed when machining these metals, the machine tool selected for the job must be rigid to prevent tool breakage.

### Coolants and Horsepower Requirements

Use of coolant during machining is essential. Due to the low thermal capacity, or high thermal conductivity, of these alloys, soluble oils should be applied. Detergent type emulsions and chemical coolants have also proved to be successful because of their high cooling ability. The coolant should be applied in a heavy flow directly to the tool tip. High dilution ratios, on the order of 40 to 60:1, should be used. This will increase the rate that heat is removed from the cutting edge of the tool.

By referring to Tables 2, 4, and 6 it can be seen that the required surface speeds for turning high-temperature alloys are low. Total horsepower requirements, also, are often low (below 10 hp). Horsepower values (hp/cubic inch/minute) for the heat-resistant alloys are given in Table 8. Cutting tools should be replaced before they become dull, as the horsepower values increase measurably when turning with dull tools.

Spacer ring for the compressor section of a jet engine is being finish machined on a 32-inch lathe at the Merz Engineering Co. Wall thickness of the spacer rings is only 0.085 inch.





The quality of crankshafts produced for outboard motors has been improved and production increased by changing to filtered and refrigerated, straight cutting oils for various grinding operations

W. E. KLEIN, Chief Industrial Engineer  
Evinrude Motors, Milwaukee, Wis.

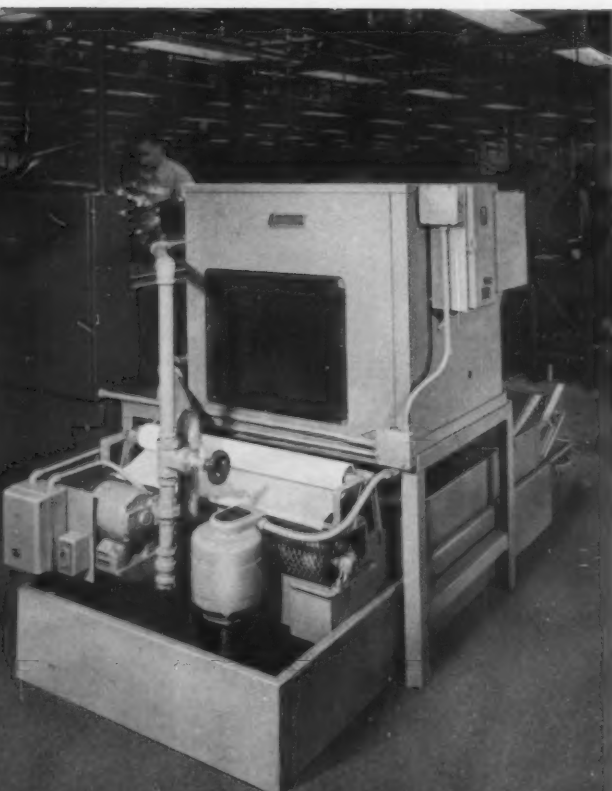
## Clean, Cool Cutting Oil Permits Better Grinding

CONSIDERABLE difficulty was being experienced in maintaining the hardness and close tolerances specified for the pin- and main-bearing surfaces of Evinrude outboard motor crankshafts. This trouble was traced to the use of an improper grinding fluid and eliminated by changing to a filtered and refrigerated, straight cutting oil.

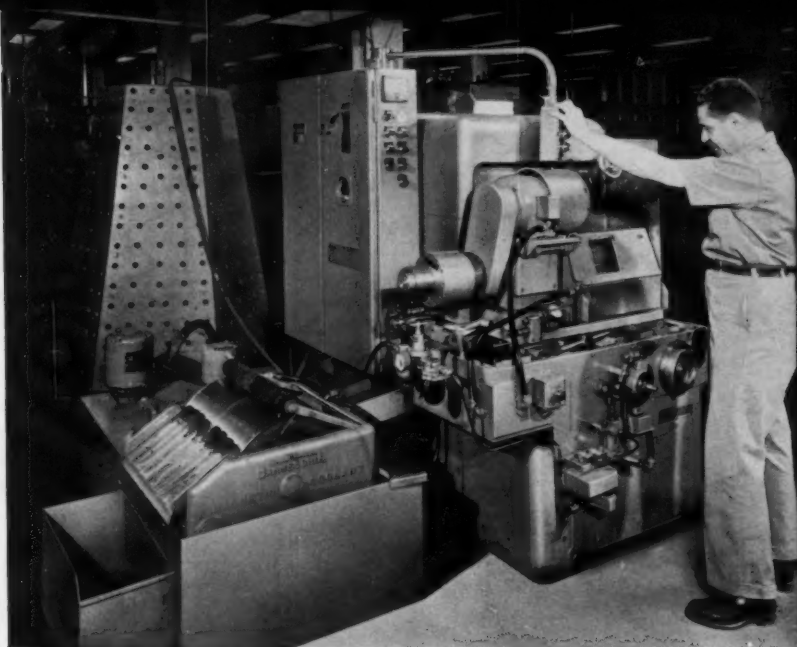
Previously, a soluble oil (mixed in the ratio of thirty parts water to one part oil by volume) was used in grinding the pin- and main-bearing surfaces of the crankshafts. These surfaces are heat-treated prior to grinding to obtain a hardness of 61 to 62 Rockwell C. During grinding, however, it was found that the hardness was reduced to between 50 and 60 Rockwell C. Now, by using clean, cool, straight oil, hardness is maintained.

Also, serious heat damage in the form of cracks and checks was formerly encountered, resulting in parts that had to be scrapped. This was eliminated and production increased. Previously, a

Fig. 1. Cloth type filtration device and refrigeration unit for removing metal chips and abrasive particles from cutting oil and keeping it at room temperature.



**Fig. 2. Magnetic coolant separator (lower left) has drum containing permanent magnets for removing metal chips and other ferrous particles from cutting oil.**



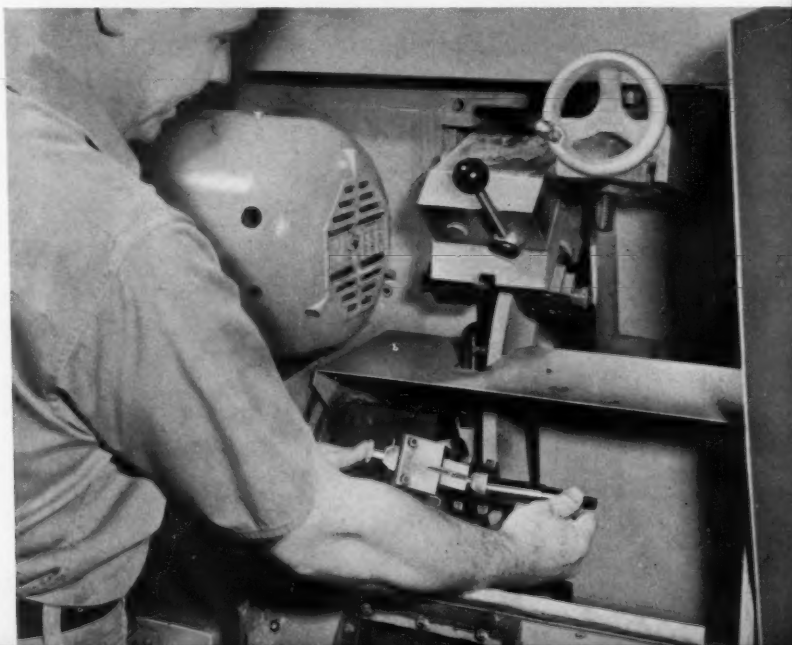
surface finish of about 20 micro-inches was produced on the pin- and main-bearing surfaces during grinding. Now, a finish of 10 micro-inches is attained—thus the amount of subsequent lapping required to produce the specified 2- to 3-micro-inch surface finish is reduced. Other advantages include the need for fewer wheel dressings and the greater ease with which the bearing diameters are held to a 0.0003-inch tolerance.

Dascolene 201X, a mineral-lard cutting oil made by the D. A. Stuart Oil Co., Ltd., is currently being used for crankshaft grinding. The Saybolt viscosity of this oil varies from 120 to 135 seconds at 100 degrees F., and the gravity A. P. I. (American Petroleum Institute) is about 27. The flash point is 345 degrees F., minimum; and the fire point, 390 degrees F. Total sulphur content is a minimum of 0.5 per cent.

One of the machines used to grind the pin-bearing surfaces is seen in the heading illustration. On this grinder, made by the Landis Tool Co., both ends of the crankshaft are held in driven heads, and the part is clamped by hydraulically operated fixtures. Both hand and hydraulic feeds are provided for the grinding wheel head, which carries a 36-inch diameter wheel. The wheel-head moves through a complete automatic cycle—rapidly advancing to grinding position, slowly feeding into the work, dwelling during the spark out period, and rapidly returning.

Since the cutting oil currently being used has a higher viscosity than the fluid previously employed, chips and abrasive particles from the wheel are retained in suspension. To remove these materials, the oil flows through a Delpark filtration unit, Fig. 1, mounted alongside the

**Fig. 3. Outboard motor crankshaft is held in air-operated collet and located by sliding block, in preparation for grinding pin-bearing surface and counterweights.**





grinding machine. This unit, which has a tank 78 inches long by 30 inches wide and 10 inches deep, employs disposable filtering cloth, supplied in rolls, to remove metal, abrasive, and foreign particles from the oil. A continuous mesh conveyor over the tank supports the filter cloth as it is automatically unrolled by means of a float control. Used cloth falls into a container at one end of the tank.

Clean oil is recirculated by pumps through a Frostrade refrigeration unit (seen mounted above the filtration tank) before it is returned to the grinding machine. The temperature of the cooled oil can be varied and is set to conform with the ambient room temperature. At 90 degrees F., the 2-hp refrigeration unit has a capacity for removing 23,000 Btu per hour from the oil.

Pin-bearing surfaces and adjoining counterweight faces are ground on the Jones & Lamson form-grinding machine seen in Fig. 2. This machine is equipped with a magnetic coolant separator made by the Barnes Drill Co. The cutting oil is continuously circulated around a drum of permanent Alnico magnets which removes metal chips and other ferrous particles. Non-magnetic particles settle out, and the tank is cleaned about

once a month. A refrigeration unit has not been provided on this machine because it is still in the experimental stage; and, so far, there has been no problem resulting from overheated small pins.

The operator manually places the crankshaft in an air-operated collet and locates the part by means of an angularly mounted, sliding block, Fig. 3. Then a cycle button is depressed to initiate a completely automatic, cam-controlled cycle—including high-speed approach, variable wheel feed, sparkout, and fast withdrawal. Automatic positive size control is also attained by holding the wheel-slide against a positive stop with uniform hydraulic pressure. The grinding wheel is automatically trued by a diamond dressing device after completing fifteen work-pieces. The grinding cycle requires only twenty-four seconds, and floor-to-floor time is fifty-five seconds.

From 0.020 to 0.030 inch of stock is ground from the pin-bearing diameter, and a surface finish of 8 to 10 micro-inches is produced. A resinoid-bonded, aluminum-oxide abrasive wheel of 100 grain size, 20 inches in diameter by 3/4 inch wide, is used for this operation. The work is rotated at 493 rpm (100 surface feet per minute), and the wheel at 9300 feet per minute.

## "Machine-Gun" Assembly of Semiconductors



Development of a new "machine-gun" assembly technique has been announced by Hughes Aircraft Co., Culver City, Calif. The new manufacturing shortcut substitutes mass-production methods for long, laborious handwork in incorporating tiny semiconductors, which replace large vacuum tubes, into electronic circuits.

The technique uses long flexible belts of precisely spaced semiconductors that feed into stapling machines, as seen in the accompanying illustration. The machines tack the tiny electronic components into place. Formerly, workers had to handle each semiconductor separately, thus limiting output.

**Machine staples tiny semiconductors into electronic circuits, eliminating hand assembly formerly required.**

# North American Research on Machining Titanium Alloys

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**T**WO years ago the design engineers at North American Aviation, Inc., began to use titanium alloys for large structural members in order to meet the thermal requirements of supersonic flight. Tail assemblies featuring machined tapered skin, pockets, and integral stiffeners were already being designed. At that time, titanium alloys were known to be extremely difficult to machine, and few shops had ever handled these metals.

The biggest problem confronting engineers then concerned the ease and speed with which their designed parts could be produced. There was an urgent need to determine design criteria for surface finish, minimum skin thickness, fillet radii, degree of warpage, limiting width to height ratio for integral stiffeners, and the effect of work-hardening. A knowledge of the machining rate was also needed for comparison with other metals in order to establish production costs for titanium alloys.

To cope with this situation, a program for test-machining titanium with the specific purpose of obtaining the much needed design information was proposed. It was also decided to keep cutting techniques abreast of the current trends in tool development. Taking these factors

into consideration, a study of titanium alloy machining was initiated.

Two annealed plates of Rem-Cru C-110M (AMS 4908) titanium alloy measuring 1/4 by 36 by 72 inches and 1 by 36 by 72 inches were employed in these tests. This material contains 0.1 per cent carbon, 0.03 per cent nitrogen, 7 per cent manganese with the balance being titanium. The mechanical properties are: ultimate tensile strength 131,200 psi; tensile yield strength 129,300 psi; and elongation 20 per cent. As a result of the experiments, information on the machining of titanium alloys was acquired and a number of design and shop procedures were recommended.

## *Problems Concerning the Material*

Titanium-alloy plates, being hot-rolled at the mill, invariably came with oxide scales which were not readily visible. Such scales are very hard on cutting tools and should be removed by sanding or pickling, whichever is permissible.

Friction-sawing is the most effective method for material preparation. Even a dull blade that has been used for steel is satisfactory. Blade speed should be at least 10,000 surface feet per minute, and the cutting should be done dry.



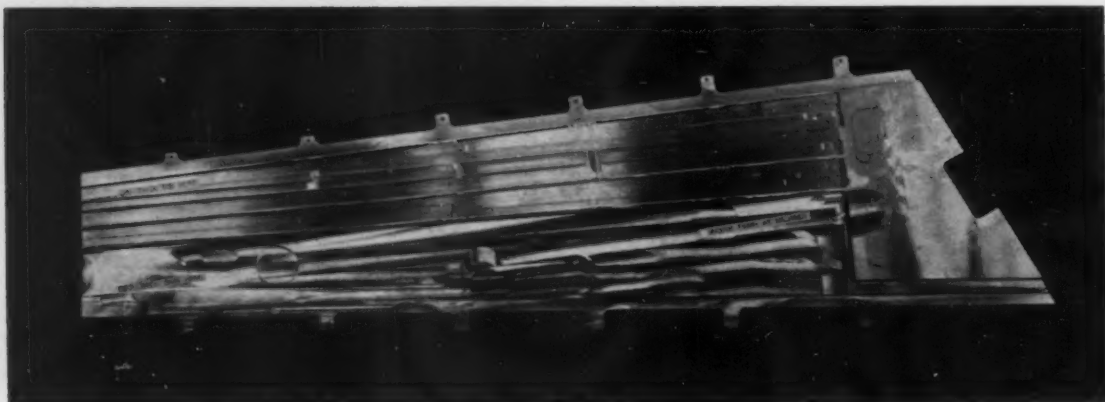


Fig. 1. A 1-inch thick titanium plate (22 by 72 inches) machined to a composite design features a tapered skin area and an integrally stiffened stabilizer configuration.

Carefully annealed titanium alloys present little warpage problem. The 1-inch thick test plate—carefully annealed—showed a negligible amount of warpage when an open area of approximately 10 by 54 inches was tapered from a thickness of 1/4 inch at one end to 0.020 inch at the other (heading illustration and Fig. 1).

Titanium alloys do not work-harden to the same extent as some of the stainless steels. When trouble is encountered in drilling small holes, a dull drill is usually the cause. Keeping the cutting tool sharp will normally eliminate this trouble.

When the cutter becomes dull, burrs will form along the edge of the tool path. This is a warning signal that the cutter must either be resharpened or replaced. Unless this is done, excessive damage to the cutting tool will result. Burrs must be removed before cutting is resumed.

There is a certain amount of fire hazard in machining titanium, as chips of about 0.001 inch or thinner will burn readily when ignited by the heat generated. Although, as far as it is known, there has been no inadvertent ignition of thick

chips or solid pieces of titanium alloys, and the usual fire preventive measures are believed to be adequate.

### Cutting Tool Considerations

Good results were obtained by using milling cutters with carbide throw-away inserts. Straight tungsten carbide grades such as Firth Sterling HA, NHA, or Vascoloy-Ramet 2A5 performed well in the tests.

Three features in tool geometry have been found important to carbide cutters used for machining titanium. First, negative true rakes from 10 to 20 degrees were used with good results. True rake is measured in the nominal direction of chip flow.

Also, the relief angle behind the cutting edge should be larger than that normally used for steel alloys. The titanium alloy machined in the tests has a high chip-welding characteristic. For a 6-inch diameter cutter, a 12-degree minimum relief angle was found necessary to eliminate

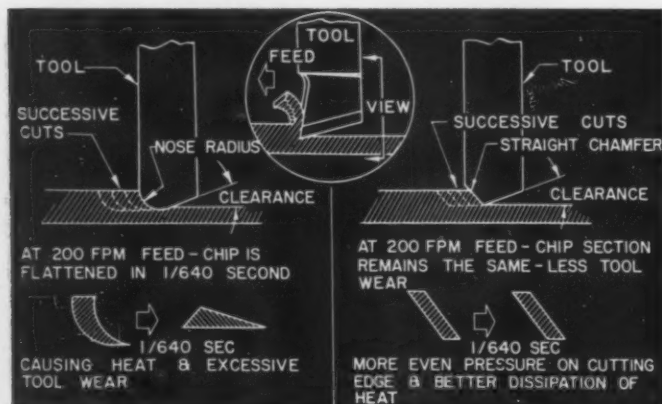


Fig. 2. Comparison of the cutting action of a radius nose tool with one having a 45-degree chamfered edge. Less work is expended when the nose radius is increased.



Fig. 3. The right half of this titanium extrusion was ruined by conventional straddle-milling, while the left half was satisfactorily machined by climb-milling.

welding of chip fragments underneath and behind the cutting edge. With Rem-Cru A110AT titanium alloy, chip welding is not as great and the relief angle can be less than 12 degrees.

Finally, when face-milling large open areas mainly to remove metal, a cutting edge angle of 45 degrees gives better tool life. Such cutters should be used in preference to those with a nose radius. The depth of cut, however, should not extend above the chamfer edge.

When it is desirable to have a fillet radius on the machined part, the radius should be kept as large as permissible, up to 1/4 inch. In regard to cutters with a nose radius, a larger radius results in a longer tool life.

A tool with its cutting edge at 45 degrees to the work performs better than a cutter having a 1/16- to 1/4-inch nose radius. With the 45-degree chamfer the pressure is distributed evenly along the cutting edge. Also, under identical machining conditions the cutting temperature of a tool with a nose radius is believed to be higher.

In comparing a nose radius with a 45-degree chamfer, Fig. 2, it can be seen that before cutting, the metal that is to form the chip has a curved cross-section when a nose radius tool is used. During cutting, the chip is forced to flow up along the flat tool surface. Chips show a triangular cross-section with flat bottoms. It is estimated that this flattening action takes place in about 1/640 second at a cutting speed of 200 surface feet per minute.

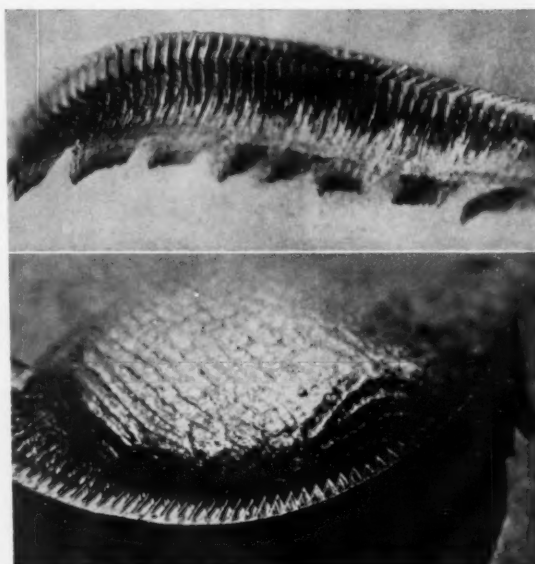
When a piece of wire is bent back and forth rapidly many times, heat is generated by intermolecular friction. For the same reason, the rapid flattening action which takes place at the cutting edge of the tool generates considerable additional heat. On the other hand, the 45-degree cutting edge produces ribbon-like chips without this flattening action and extra heat. Because the machining of titanium alloys is inherently characterized by high tool-chip interface temperatures,

any available method to minimize the heat on the cutting tool should be utilized.

In machining titanium alloy with carbide cutters, a sulphurized oil was found to give the best tool life. Intermittent quenching is undesirable for carbides. In the tests, dripping oil was sprayed on by compressed air. It has resulted in excellent lubricity, good surface finishes, and a moderate amount of cooling. As the compressed air helps to carry away the chips, chip welding is materially reduced.

In the tests under discussion, the best cut obtained was of about seventy minutes' duration with Firth Sterling NHA grade tungsten carbide. Using a cutting speed of 175 surface feet per

Fig. 4. Typical titanium chip (top) is 0.030 inch thick and shows segmentation which results from ultrasonic chattering. The same chip held in a piece of plastic putty is seen below.





minute and a feed of 0.005 inch per tooth, the face-milling cut was 1/8 to 1/4 inch deep. This 4-inch wide cut was taken with a 6-inch diameter cutter and, for a cutting fluid, sulphurized oil was applied with compressed air. As to machining practice, climb-milling is generally preferred since it tends to eliminate trouble from chips welding to the cutter, Fig. 3.

The question of whether to use high-speed steel or carbide cutters on titanium comes up frequently. High-speed steel is tougher and can stand impact and the high-frequency chattering better than carbides. But carbides have a higher resistance to heat and wear during cutting. Because the machining of titanium is characterized by high tool-tip temperatures, high-speed steel having a high red hardness is desirable for this purpose.

Therefore, for turning operations, the throw-

away insert type carbide cutter would be preferred. In milling operations, it would be more advisable for the beginner to start with high-speed steel and to experiment with carbide until he becomes familiar with the many difficulties in machining titanium alloys. Some of the major problems in the milling of titanium alloys with carbide tools are rigidity in cutter and setup (to reduce high-frequency chattering), impact, chip welding, heat dissipation, abrasive scale on the work-piece, and the choice of carbide grades.

In the design of high-speed steel or carbide milling cutters for titanium alloys, it should be kept in mind that titanium chips are rather straight. Attention should therefore be given to the chip pocket profile to facilitate chip flow.

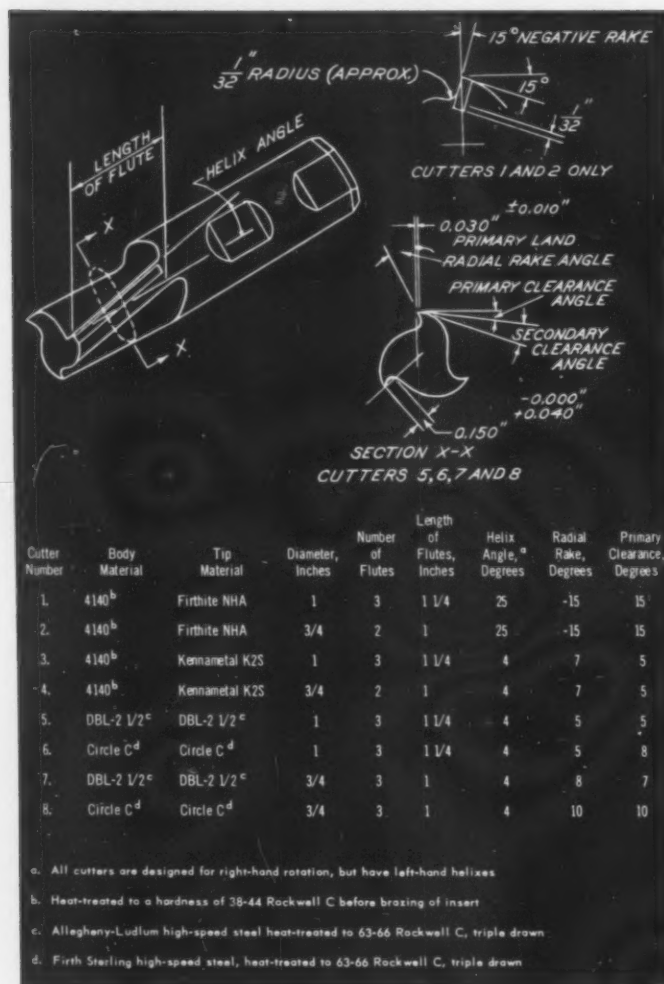
Negative radial rake angles of 5 to 10 degrees have been applied with good results to single tooth carbide end-mills as small as 1 1/4 inches in diameter. With compressed air and oil mist, slots 1/4 inch deep have been cut at a 2 1/2-inches-per-minute table feed and a cutting speed of about 175 surface feet per minute. The designs of some experimental cutters for titanium alloys are shown in the accompanying table.

### Rigidity is Important

Since rigidity is an important factor in machining titanium alloys it deserves some mention. The segmented chip (Fig. 4) was formerly considered by many as a characteristic peculiar to titanium alloys. Research at North American did not support this concept. Segmented structure has been observed in the chips of many kinds of alloys—such as 4130 and 4340 steels, 321 and AM355 stainless steels, aluminum, and magnesium alloys. Moreover, it has been proved at North American that segmentation is actually caused by a form of very high frequency (in the ultrasonic range) chattering or vibration. Because the ultrasonic frequency cannot be heard, its existence will naturally escape the attention of the machine operator.

It has been further demonstrated (Fig. 5) that the degree of chip segmentation can be influenced by the rigidity of the cutter and the setup, a damping device applied to the tool, and the speed and feed of

Experimental Cutters for Milling Titanium Alloys



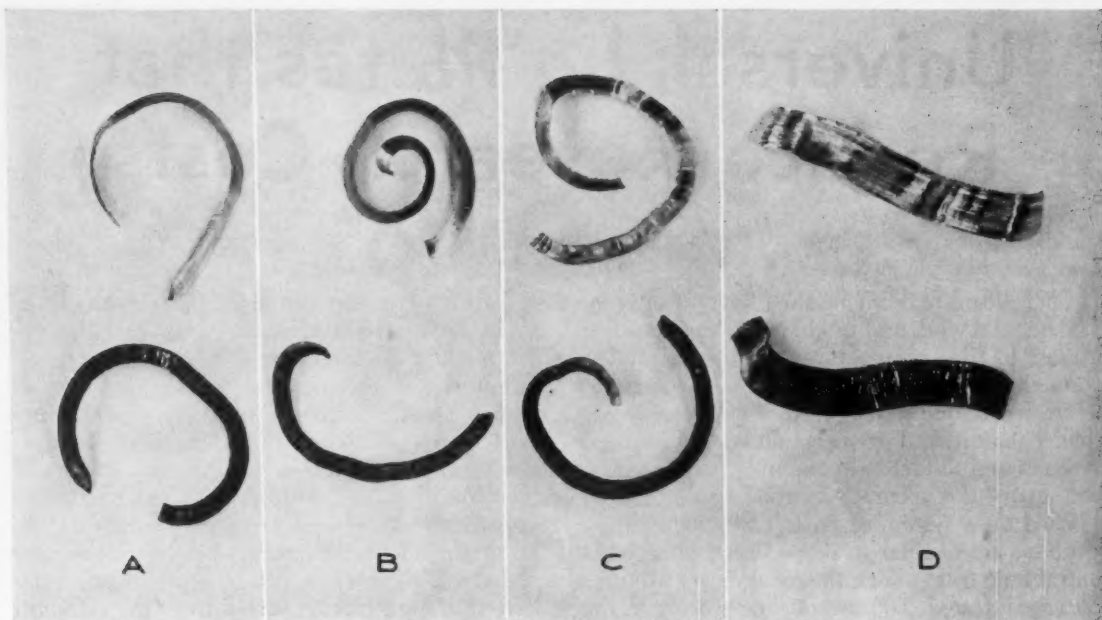


Fig. 5. Titanium chips which are essentially non-segmented are produced on a rigidly constructed milling machine. A cutting speed of 75 surface feet per minute was used. Chip thicknesses, in inches, are A, 0.010; B, 0.015; C, 0.020; and D, 0.025.

cutting. Of the three, rigidity is considered the most important.

Chip segmentation is harmful to the cutting tool. Ultrasonic chattering results in fluctuation of pressure along the cutting edge. It is reasonable to conclude that surface fatigue failure of

the tool could occur at the cutting edge from this cause. In fact, it has often been observed that the extremely short tool life resulting from premature chipping of the fine cutting edges was associated with segmented chips. However, laboratory proof is not yet available.

### **Cadmium-Plating Method Prevents Hydrogen Embrittlement**

Through the use of vacuum deposition, hydrogen embrittlement of cadmium-plated steel parts can be eliminated. The new plating method was developed by the Lockheed Aircraft Corporation in conjunction with Anadite, Inc., South Gate, Calif.

In this process, the work-pieces are suspended in a vacuum chamber and cadmium is vaporized beneath them. At no time is an electric current passed through the parts, which remain at practically room temperature.

Deposits of 0.0003 to 0.0005 inch can be uniformly maintained and greater thicknesses can be accomplished if desired. The high throwing power of the vacuum process permits an almost completely unvarying coating to be deposited in both high and low areas of recesses. The process is currently used for coating steel parts for the Lockheed prop-jet Electra.

### **New Process Increases Mill Yields of Some Stainless Steels**

Traces of boron added to austenitic chromium-nickel and chromium-manganese alloys in a new, patented process greatly improve the hot-working properties of these stainless steels. Announced by the Armco Steel Corporation, this new method affects hot ductility markedly in the 2000- to 2400-degree-F. temperature range. The quantity of boron required for significant improvement in mill yield is extremely small, varying from 0.0001 to 0.0080 per cent.

No measurable effect of boron on ingot structure, grain size, or over-all non-metallic content has been found to date, except that normal inclusions appear to be made more malleable. Boron appears to alter the basic fracture mechanism at high temperatures. The usual intergranular type of rupture is inhibited. Failures of the boron-treated material are mainly transgranular and are accompanied by improved ductility.

# Universal Jig Plates that Reduce Research Costs

HARRY W. WILLIAMS, Richmond, Ind.

**A**NY means of reducing the high cost of experimental work and product development is of interest to the manufacturer. Prototype models, gages, dies, jigs, and fixtures are usually necessary before full-scale production of a new part is possible. The universal jig plates illustrated in Fig. 1 were devised to facilitate one important phase of tooling up—the accurate location of holes.

Based on a system of polar coordinates, these jig plates are circular in shape. Each plate has a central hole from which the locations of all other holes are referred. To prevent excessive wear, this reference hole is provided with a hardened steel bushing, pressed into place. Extending in spiral fashion from the center of the plate are a group of holes having the same diameter that bear a fixed angular relation to each other. In addition, the distances between the center of the plate and the centers of these holes increase in consecutive 1/32-inch steps within the effective range of the jig plate. The effective range of the plate seen in Fig. 2 is from 1.750 to 3.125 inches. In this par-

ticular jig plate, the first eight holes in the spiral are at 1/8- and 1/16-inch steps for convenience.

A set of sixteen eccentrically ground bushings permit any desired spacing between drilled or reamed holes, within the range of the plate, to an accuracy of 0.0005 inch or better. These bushings vary in their eccentricity by 0.001-inch steps from 0.001 to 0.016 inch. The direction of eccentricity is marked on each bushing. With this arrangement, the distance between the center hole and the center of any hole produced, using these bushings, can be varied from the standard dimension marked on the plate by plus or minus the eccentricity of the bushing. A finger bar clamped to the plate enters one of two slots provided in the head of each bushing to hold it in the proper eccentric position and prevent its rotation.

Small indexing holes spaced 5 degrees apart are located near the outer edge of the plate on a pitch circle concentric with the central reference hole. These holes are used in conjunction with a small dividing attachment consisting of curved

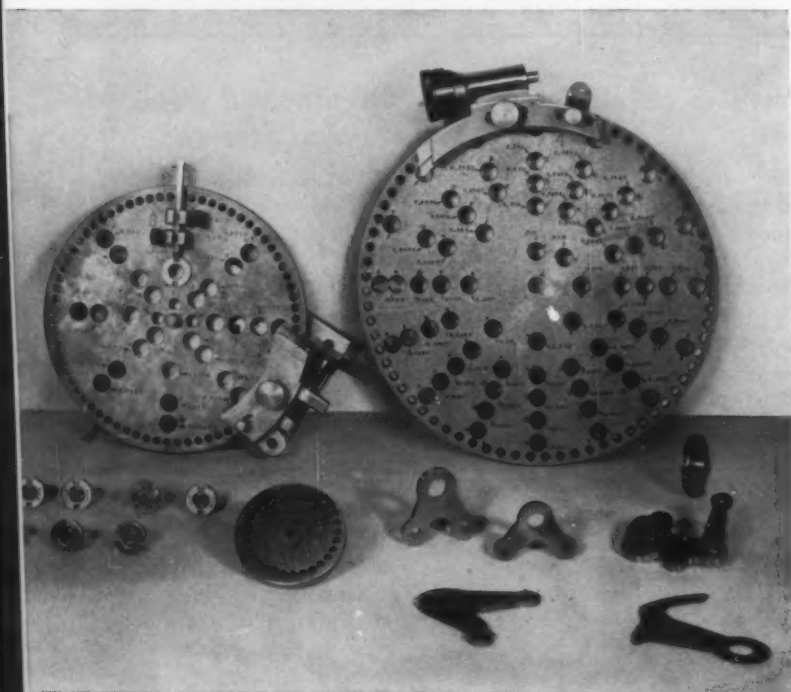


Fig. 1. Two universal jig plates that are used to accurately locate holes about a reference hole in a work-piece. A number of eccentric bushings (left) and work-pieces (right) are in the foreground.

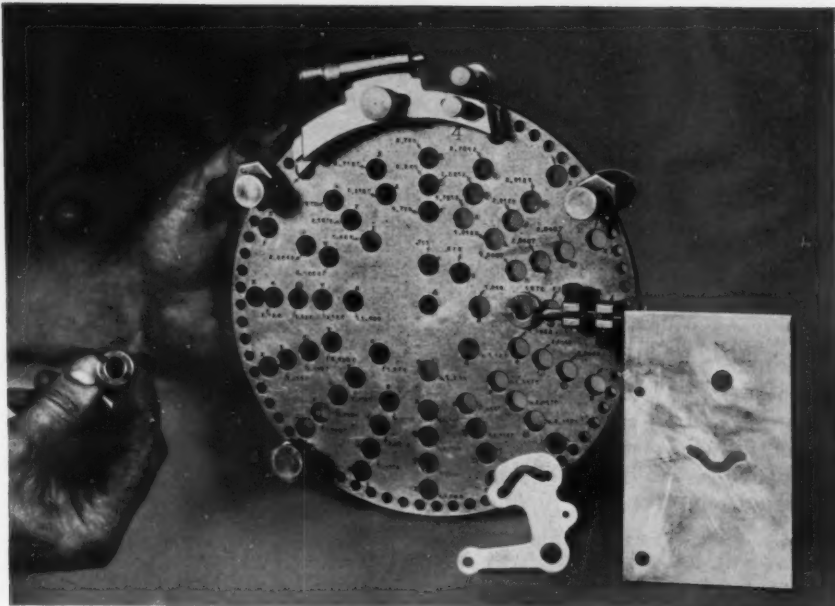


Fig. 2. Close-up view of a universal jig plate. Dividing mechanism at the top can be employed to position the work-piece at any desired angle with respect to the plate.

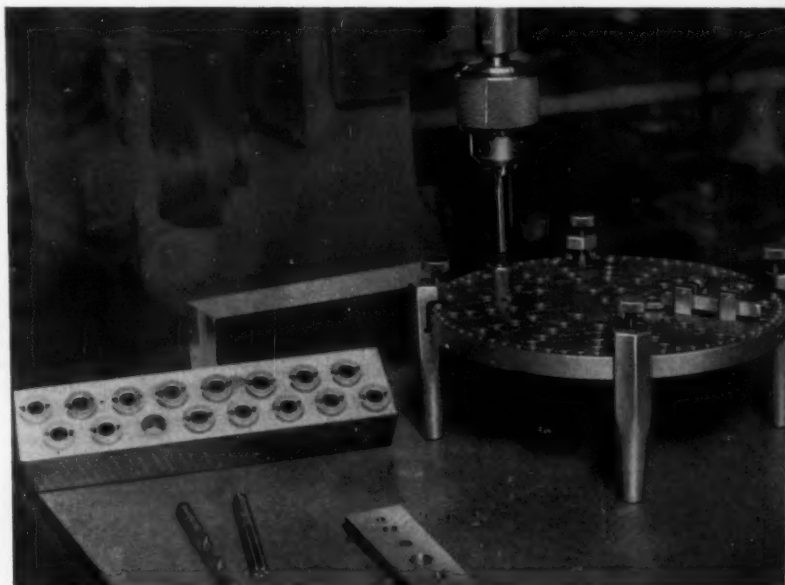
slides that are moved in relation to each other by an accurate worm and gear. One slide of the dividing mechanism is held fixed to the jig plate by fitting two pins into appropriate index holes. The other slide is coupled to the work-piece which is permitted to rotate about the center reference hole. A hardened and ground steel pin fits into both the reference hole in the work-piece and the center (reference) hole in the jig plate to serve as a pivot. In this manner, any angular spacing between holes can be obtained.

To recapitulate, within the range of the jig plate in use a series of drilled and reamed holes

either in a straight line or on a pitch circle can be quickly and accurately spaced in any number of divisions. A typical setup is seen in Fig. 3. As these jig plates are used in conjunction with a drill press, the more expensive machines in a shop can often be released for other work.

Applications of such jig plates are numerous. For example, with one attachment, the use of the plates may be extended to locating holes about any point on a work-piece. This eliminates the need for a reference hole. The work-pieces shown in Figs. 1 and 2 give some small indication of what can be accomplished with these jig plates.

Fig. 3. Here the jig plate is set up for drilling and reaming holes on a drill press. A set of sixteen eccentric bushings (left) is required for complete dimensional coverage.





# Coating for Drawing Steel Applied Automatically

HERBERT CHASE

**S**TAMPINGS of many shapes and sizes are produced in large volume by the Brown-Lipe-Chapin Division of General Motors Corporation, Syracuse, N. Y. An important step in these operations is the conversion of coil or sheared stock into blanks that are ready coated for drawing and forming. In one area of the company's new plant, blanks are cleaned and wax-coated while carried on a monorail conveyor system.

Two presses prepare the blanks, one being fed with coil stock and the other with sheared strips. Blanks up to 30 inches long and 18 inches wide are produced from steel not over 0.093 inch thick. Coils are handled in the press here illustrated. The stock is advanced by an intermittent automatic feed through a roller leveler to the die.

In general, unless they are too large, two or more blanks are produced at each working stroke of the press. All work-pieces are pushed through the die and fall on a belt for transfer to a loading station. Here, the blanks are placed manually in steel racks carried by a continuous monorail chain conveyor.

Scrap from the blank is cut up at the die and allowed to fall on a second horizontal belt. After being transferred to an inclined belt, this waste material is fed into a large container that can be hoisted onto a truck for removal. On a smaller press, blanks are produced from sheared stock fed by hand. This machine is used for short-

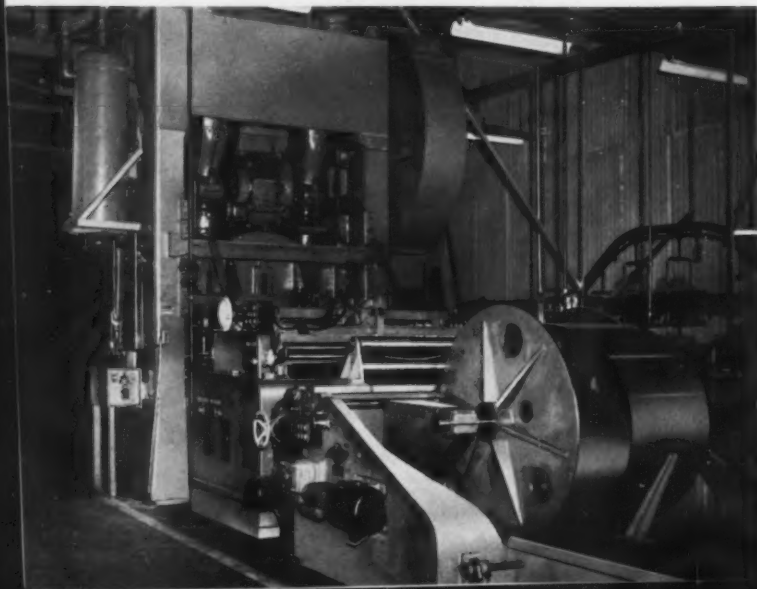
run work or for blanks not suited to the larger press setup.

Blanks and scrap from the smaller machine are handled in a similar manner. A portion of the monorail line and some carriers for the blanks can be seen to the right of the press in the illustration. Each work-piece is loaded on edge between dividers that keep the blanks separated and both faces exposed.

Before wax coating is done, oil and grease must be washed from the blanks. To do this, the monorail conveyor carries the blanks through a heated bath of North West No. 47 emulsion cleaner and then through a cold water rinse. Air jets help to blow the water from the blanks.

The blanks then enter a hot wax draw coating solution, and a thin film adheres to the surfaces. After passing through a warm air drying area, the coating hardens enough to permit the blanks to be unloaded and stacked by hand without sticking together. The blanks are subsequently sent to presses where forming and drawing operations are accomplished. No further coatings with draw compound are required.

Waxing done in this manner provides a good lubricant, facilitates drawing, helps to minimize scratching, and reduces wear of the dies. This treatment is fast, involves little labor, and is cleaner and more economical than applying the lubricant at draw presses.



Press used for production of stamping blanks from coiled steel. Blanks are fed to the monorail conveyor (right background) where they are hand-loaded in racks for transport through cleaning and waxing tanks.

# Condensed Review of Some Recently Developed Materials

Arranged Alphabetically by Trade Names

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Aluminum Alloy	Alcoa Alloy X6463	A heat-treatable aluminum alloy which can be anodized to achieve a bright finish on a commercial aluminum extrusion.	Used in the production of brightly anodized aluminum extruded shapes such as automotive bumpers, grilles, and trim on appliances.
Aluminum Solder and Flux	Alcoa Solder No. 805 Alcoa Soldering Flux No. 66	The solder contains 95 per cent zinc, 5 per cent aluminum, and has a melting range of from 715 to 725 degrees F. The flux, which reacts at 720 degrees F. to wet aluminum with zinc, can later be removed by flushing with water heated to 180 degrees F.	Joins all aluminum alloys and makes joints between aluminum and copper, brass, stainless steel, steel, nickel, etc. Has been used to join heat-exchanger return bends, electrical connections, and automobile radiators.
Aluminum Sheet	Alcoa Soldering Sheet	A zinc-clad aluminum alloy which brings aluminum within the range of easily soldered materials.	Simplifies normal maintenance and repair problems of soldered assemblies, particularly in the automobile radiator field.
Silver Solder Alloys	All-State No. 105 Medium-Temperature Solder All-State No. 107 General-Purpose Silver Solder	The melt and flow points are in the medium-temperature range—between soft solders and low-temperature brazing alloys. Shear strengths of 18,000 and 20,000 psi are obtainable from these alloys.	Recommended for lap, sleeve, and socket type joints. Each alloy requires a special flux, and its residue should be washed off.
Ceramic Material	AlSiMag 491 Ceramic	A deburring agent for machined or stamped metal parts and sheet metals such as aluminum. This material does not load up with metal and is not affected by high speeds.	Besides deburring, it is also used for producing a keen edge on precision tools—even those made of carbides.
Stainless Steel	AM350	This steel is soft and ductile and readily fabricated in the initial condition. It is then hardenable by heat-treatment at a temperature low enough to prevent excessive scaling or distortion in the hardened condition. It exhibits high impact strength at low temperatures as well as good corrosion resistance.	Applications other than those in the aircraft industry include such items as flat and coiled springs, corrosion-resistant fasteners, dental and surgical equipment, saws and saw blades, piston rings, glass molds, pump parts, camera parts, and cutlery.
Aluminum-magnesium Alloy	Apex 417	A free-machining alloy with high strength, ductility, dimensional stability, corrosion resistance, and good anodizing characteristics.	Used by aluminum foundries to make castings for the agricultural, aircraft, automotive, machine tool, and marine industries.
Penetrating Oil	Bear Penetrating Oil	A fast-acting penetrating oil having properties of lubrication and rust prevention and a high flash point.	Loosens rusted and frozen metal parts such as bolts, bushings, pipes, and battery connectors.
Strip Material	Beryllium-Copper Strip	A beryllium-copper strip rolled to a thickness of 0.001 inch with a tolerance of plus or minus 0.0001 inch.	Used as a pressure-sensitive diaphragm in ice-detection control systems in aircraft.

For names and addresses of manufacturers of products listed, see end of this section

## Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Stainless-steel Wire	Blue Label Stainless-Steel Wire, Type 302	This wire is corrosion-resistant, has good coiling properties, and can be bent sharply.	Designed primarily for use in the production of springs, it is also suitable for other types of products employing wire forms.
Thermoplastic Sheet	"Bondized" Califilm "Bondized" Kelon-F	These specially treated thermoplastic sheet materials can be bonded to a variety of materials using ordinary adhesives. The Califilm is available in thicknesses ranging from 0.005 inch to 0.015 inch, and the Kelon-F in thicknesses ranging from 0.015 inch to 0.250 inch.	For cementing steel, aluminum, wood, etc., in parts that encounter wear or corrosive conditions such as liners and coverings for tanks, jigs, fixtures, rollers, and machine parts.
Epoxy-base Adhesive	Bondmaster M620	This single-component, epoxy-base adhesive has a smooth, buttery consistency which enables it to be spread on parts being bonded to the proper depth using a brush or spatula. Material does not "drip" or "run" either before or after curing.	Used to bond metal to metal or to rigid plastic.
Shielding Material	Boral	A neutron shielding material which is important to atomic energy installations. It is made from boron carbide and aluminum.	A 1/4-inch plate has an effective shielding power equal to that of a concrete slab 100 times greater in thickness.
Cemented Carbides	CA-606 CA-609	Steel-cutting carbides developed to give great edge wear without loss of shock resistance. Both contain anti-cratering ingredients.	Grade CA-609 used where cuts are in excess of 1/16 inch. The other grade is useful where close machining tolerances must be maintained.
Sintered Aluminum Oxide	Ceralox OX-12	This material glows at red heat when operating as a cutting tip, yet work-piece remains cool. Chips do not weld to this material which is highly resistant to cratering.	Capable of cutting steel over a wide speed range without undue wear.
Alloy Steel	Chromewear	A steel with great wear and abrasion resistance. Abrasion resistance said to be approximately five times that of air-hardening, high-carbon, high-chromium type steels.	Heat-treatable to a high hardness, it is tough enough for most tooling applications. It should be used where machining and grinding requirements are relatively simple.
Silicone Rubber	Class 700	A silicone rubber that remains flexible at 600 degrees F. for 150 hours or longer. Other properties include: resistance to ozone-aging and weathering, low-temperature flexibility, and a low moisture absorption property.	Suitable for molding, extrusion, or calendering fabrication methods. Uses include: oven door seals and parts for hot materials handling equipment.
Molybdenum-base Alloys	Climax Molybdenum-Base Alloys	Four molybdenum-base alloys each containing only one of the following four alloying metals—columbium, titanium, vanadium, and tungsten—have been made available. They exhibit high structural strength at elevated temperatures.	For use in gas turbines and other high-temperature equipment in aircraft and missiles. Also for electrodes and auxiliary equipment for glass-melting furnaces and piercing points used in the manufacture of seamless tubing.
Brazing Alloys	Coast Metals 50	A series of high-nickel brazing alloys with the same mechanical properties and corrosion and oxidation resistance as the stainless and heat-resistant alloys which they are designed to join. All alloys have good flow and wetting qualities.	Used to braze rocket nozzles to their respective components and also to coat or braze roller parts, honeycomb materials, jet-engine components, and valves.

## Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Silicone Rubbers	<b>Cohrlastic HT 655</b> <b>Cohrlastic HT 666</b>	These compounds are immune to ozone deterioration, flexible at high and low temperatures, and have non-adhesive surfaces. Tear and tensile strengths are 197 pounds and 1650 psi, respectively, at room temperature and are approximately halved at temperatures of 400 degrees F.	Materials are being used in the aircraft industry for making external seals.
Hard-facing Material	<b>Colmonoy No. 70</b>	A nickel-chromium-boron-tungsten hard-facing material that provides a wearproof, corrosion-resistant surface to parts exposed to extreme conditions of vibration or heat.	For overcoming fretting and fretting corrosion on jet-engine shafts. Also used on engine valves, chemical valves, acid pump parts, and cold washers.
Aluminum Sheet	<b>Colorweld</b>	A pre-enameled, pre-finished aluminum coil with finishes that are flexible; resist scratches, abrasions and weathering; and come in twenty colors, including five pastel shades.	For fabricating aluminum products in a variety of organic finished colors directly on roll-forming machines, press brakes, or draw or punch presses.
Powder-metal Compound	<b>Compo-E</b>	A powder-metallurgy compound developed for the production of oil-retaining bearings. It combines the strength of iron with the anti-friction and long-life properties of bronze.	Used in fan motors, air-conditioning motors and drives, record players, tape recorders, and home laundry equipment.
Spherical Corners	<b>Conner Spherical Corners</b>	These corners are furnished in metal thicknesses ranging from 1/8 inch to 1/2 inch and in outside radii from 1 1/8 to 3 inches.	They are easily welded into place on weldments having round edges such as machine tables, housings, drip pans, and panels.
Aluminum Putty	<b>Devcon F</b>	An 80-20 aluminum plastic putty which adheres to aluminum, steel, bronze, brass, and cast iron. When hardened, it can be machined to a feather edge; sand-blasted or treated in a Pangborn or similar machine; or painted and then baked. It will not bubble, shrink, or run at regular baking temperatures.	For filling very large and small holes in aluminum and steel castings, to cover holes which have been drilled incorrectly, and to build up worn sections.
Plastic Tape	<b>Devoseal No. 12</b>	A thin but tough tape made from an unplasticized, polyvinyl chloride film which resists heat, cold, acids, alkalies, and abrasives. It is pressure-sensitive and does not dry out or become brittle.	For waterproof sealing of chemicals, decorative banding and coding, prevention of galvanic corrosion, and the protection of items going through a production line during manufacturing.
Nickel Alloy	<b>Ductile Ni-Resist</b>	A high-nickel alloy cast metal that exhibits ductility as well as corrosion resistance. Tensile strength, 58,000 to 65,000 psi; elongation, 8 to 20 per cent.	Used in aircraft and chemical equipment, pumps, and compressors.
Protective Fabric	<b>Dynel</b>	A fabric overlay that protects low-pressure laminates from chemicals, abrasion, and weathering. It is used with polyester and phenolic or epoxy resin laminates.	Uses include the overlaying of glass-reinforced laminates throughout the chemical field. Products such as boat hulls and aircraft assemblies can also be overlaid with this fabric.
Teflon with Additives	<b>Enflon</b>	Improved tensile strength, compressive strength, lower coefficient of thermal expansion, lower heat distortion, and generally a stiffer material than Teflon.	Well suited for use as bearings, valve guides, pressed washers, bushings, inserts, rotating mechanical seals, and gaskets.



## Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Copper Coloring Process	Enthocolor 220	Adhesion of finishes is good. Coated work can be severely deformed without causing coating to flake.	For producing uniform brown oxide coatings on copper and its alloys and blue-black coatings on certain brasses.
Tooling Compound	Epocast	An impact-resistant plastic tooling compound made from a combination of liquid epoxy resin and a polysulphide liquid polymer. Has a durometer hardness of 80 to 95.	Suitable for the production of facings for drop-hammer dies.
Epoxy Resin	Epocast 13	A fluid epoxy resin which, when mixed with appropriate amount of hardener, has a pot life of eight days. Curing temperatures range from 200 to 250 degrees F.	Used for potting and encapsulation of electrical components and as a filler material for making large mechanical castings in the machine tool and other industries.
Aluminum Casting Alloy	F132	Replaces D132 in order to conserve nickel. Tensile strength, 36,000 psi; yield strength, 28,000 psi; elongation, 1 per cent in 2 inches; and Brinell hardness, 105.	For castings formerly using aluminum alloy D132.
Steel Bar	Fatigue Proof	A high-strength free-machining steel bar which requires no heat-treating. Machines fast with no distortion, is uniform in structure, and exhibits good wear resistance.	Used for machining operations requiring a high-strength steel bar and where heat-treating is not economical.
Wire	Fernicklon	A nickel-plated steel wire which is strong, corrosion resistant, and lustrous. It can be annealed, shaped, or worked without chipping or flaking of the coating.	Applications include automobile radio antennas, lamp frame wire, processing baskets, wire conveyor belting, and closely coiled helical springs.
Conveyor Belts	Fire Curtain Belts	These belts contain two plies of glass fabric encased in a rubber cover which retain their strength despite intense heat.	Developed for use in foundries where burn holes are the major cause of belt failure. Is also used in other industries in which extremely hot items are handled.
Carbide	Firthite NHA	This material developed for machining cast iron, aluminum, brass, and plastic can easily be brazed.	Used for machining aluminum-alloy parts and fabricating drilling rigs.
Protective Coating Process	Flame-Plating	This thin protective coating of aluminum oxide is abrasion-, chemical-, and heat-resistant but allows the metallurgical characteristics of the base metal to be retained.	Applied to all common engineering metals except chromium and nickel plate.
Welding Electrode	Fleetweld 5-P	An all-position, pipe-welding electrode which produces a flat-shaped bead with an even deposit of metal from which slag is easily removed.	For welding pipe, pressure vessels, structures, machinery, and ships.
Plastisol Finishes	Flintlok 40, 41, and 42 and Tufkote 20, 21, 22, 23, and 24.	These vinyl protective coatings will not scratch, chip, crack, or peel and have a high resistivity to chemicals of all kinds. The Tufkote preparations provide a thicker, more cushiony coat.	Finishes for storage tanks, shop machinery, industrial apparatus, and metal products.
Plastic Laminate	G-E Textolite (R) Cold Punch 11570	This laminate permits close registration punching at normal room temperatures. Material is translucent.	For automatic production of electronic equipment utilizing printed circuits.

## Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Investment-casting Alloy	GMR-235	This alloy has good room-temperature ductility, a very low strategic alloy content, and exhibits a marked resistance to overaging at service temperatures for over 1000 hours.	Designed for investment-cast turbine wheels, buckets, and vanes, which are to be used at temperatures in excess of 1400 degrees F.
High-titanium Carbide	Grade 330	A tough, easy-to-grind carbide with a nickel binder. It is not quite as hard as cobalt binder type carbides but is equally wear-resistant. Has a rupture strength of about 200,000 psi and a hardness of 91.5 Rockwell A.	For precision finishing and boring of steels.
Cemented Carbide	Grade 860	A milling grade carbide for milling high tensile strength cast irons that range in hardness from 223 to 248 Brinell.	For face-milling, plane-milling, or slotting operations. Performs well where heavy scale and interruptions are encountered.
Hardsurfacing Flux	H-560 Flux	This flux is used to produce a hardsurfacing deposit when employing a mild-steel electrode.	Suitable for the fabrication and maintenance of wearing parts where the service involves severe abrasion and medium impact.
Cutting Oil	Habcool 318 Tapping Oil	A cutting oil for reaming, drilling, broaching, and threading of tough alloy steels.	Facilitates the machining of alloys that could not otherwise be machined. Applicable by brush.
Powdered Brazing Alloy	Handy Alumibraze	It can be applied conveniently to any surface regardless of contour and will stay put and not flow prematurely. Strength, soundness, and corrosion resistance of joints comparable to those made with a solid brazing alloy of the same composition.	A self-fluxing brazing alloy for joining many types of aluminum alloys.
Aluminum Bar Stock	Harvey Hollow Bar	A hollow aluminum bar stock of 6066 analysis which exhibits free machinability, good corrosion resistance, high strength, and good finishing characteristics.	For producing aluminum machine parts. It provides good chip control, which results in less handling and processing.
Die Steels	Heller Nucut	Two types of these flat ground die steels are made available—the oil-hardening type which can be spheroidize-annealed for easy machinability and the air-hardening type which provides a high degree of wear resistance as well as a wide hardening range.	This line of more than 1300 standard stock sizes of flat ground die steel can be used for a wide variety of tool and die applications.
Hard-facing Paste	Hi-C 60	This paste creates a deposit of high hardness enabling surfaces to withstand extreme conditions of abrasion and heat. Hardnesses obtainable are 55 to 61 on the Rockwell C scale.	Applied by spatula, brush, or extrusion from a tube. Thicknesses of 1/4 inch can be obtained using gas heating. For thicknesses greater than 1/4 inch, induction heating is used.
Leaded Steel	Hi-Qua-Lead Steel	A leaded steel with machining characteristics that eliminate the need for certain lathe operations and result in low tool wear.	Produced in all steel grades in forged and rolled rings from 18 inches to 145 inches over-all and in ingots up to 50,000 pounds.
Magnesium-thorium Alloy	HM21XA-T8	This alloy combines light weight and strength with the ability to withstand intense heat generated by friction at supersonic speeds. Can be used in a temperature range up to 700 degrees F.	For high-temperature aircraft and missile applications.

## Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Hot-melt Compound	Hot-Melt H-983-A	This material melts near a temperature of 200 degrees F. and upon solidification machines easily. It may be melted and removed with hot water.	For the machining of stainless-steel honeycomb structures in the aircraft and guided-missile field.
Cutting Coolants	Hypercut XX	A triple-additive-treated, water-soluble cutting coolant. Lessens frictional heat, is anti-foaming, odorless, and does not affect worker's skin.	For drilling, milling, form-milling, tapping, sawing, reaming, grinding, and turning.
Resin Sealer	Impco RC-2	A resin compound which is used to seal porous metal castings. Casting is impregnated with sealant, rinsed, and then cured.	For sealing castings of cast iron, magnesium, copper, and aluminum alloys within five hours.
Hydraulic Fluid	Irus Fluid 902	This snuffer type hydraulic fluid has fire-resistant qualities that prevent it from burning on contact with flames, heated metal surfaces, or molten metal. It is non-corrosive to ferrous and most non-ferrous metals.	For use in industries where hydraulic leaks or line ruptures would be immediate fire or explosion hazards. Eliminates the possibility of combustion by releasing its water content as a protective steam blanket to quench fire.
Cutting Fluids	Jet-Cut No. 9 Flo-Cut No. 15	Cutting fluids which may be used in circulating, drip, wick, and vapor or mist systems. These fluids are odorless, non-toxic, and contain no irritants.	Used in tapping, drilling, milling, hobbing, and threading operations.
Welding Electrode	Jetweld LH-70	An all-position, low-hydrogen, iron-powder type electrode for welding of all steels with high currents and for welding crack-sensitive steels and steels that tend to produce porosity in the weld metal.	For welding low-alloy steels which must be welded without preheat, high sulphur-free machining steels, steels to be enameled, medium- to high-carbon steels, and thick sections.
Tungsten Carbide	K501	This platinum-base cemented carbide withstands extremely severe corrosive conditions and is heat resistant.	Used for seal rings, metering orifices, bushings, and nozzles.
Tungsten Carbide	Kenface	A cemented tungsten-carbide product which is used either as a hard-facing material or as a cutting material.	Used for cutting hard rock. Hard-facing applications include power shovel teeth and road scraper blades.
Protective Film	Kenvert Chrome Sealer Type Films	These films are particularly recommended for use where the paint or lacquer film has been giving premature failure in the presence of moisture.	Designed to protect common non-ferrous metals such as copper, zinc, brass, cadmium, and aluminum against tarnish and stains.
Aluminum Grating	Klemp Rectangular Riveted (RR) Aluminum Grating	A grating that remains structurally rigid regardless of cutouts. Its design eliminates possibility of foreign matter accumulating in corners.	Useful for construction and maintenance in many industries.
Vinyl-to-metal Laminate	Laminol	Consists of a tough vinyl sheeting permanently adhered to a metal base of steel or aluminum which can be drawn, bent, or crimped without damage.	For television and radio cabinets, business machine housings, luggage, instrument panels, and wall coverings.
Steel Bars	LaSalle Large Hexagon	C-1018 steel bars made in a 3- to 4-inch size range. They are available in increasing increments of 1/4 inch.	For the production of large nuts, bolts, and other hexagon-shaped parts.

## Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Nickel-plating Process	Levelume	This process combines the qualities of "full" brightness, high leveling, and exceptional speed. Activated carbon pack in filter continuously removes harmful organic contaminants, eliminating periodic batch purification.	High leveling characteristics enable the deposit to fill in scratches to a high degree, which eliminates polishing and buffing for extra smoothness after plating. Objects can be double-coated.
Chemical Sealant	Loctite	A liquid which hardens automatically in the joints between metal parts, sealing the joints pressure-tight and bonding parts together with a tough heat- and oil-resistant plastic.	For treating nuts, bolts and other fasteners, and sleeve joints. Also for sealing porous welds and leaky threads in pipelines and process equipment.
Nickel-base Alloy	M-252	A vacuum-melted nickel-base alloy that is suitable for extended operation under load at temperatures of 1240 degrees F. Exhibits high rupture strength, good fatigue strength, and a high resistance to thermal shock.	Used in the form of forged buckets in the first stage of heavy-duty land gas turbines.
Gear Lubricant	Marla Spray Lubricant	This open gear spray lubricant possesses high adhesive qualities. It is an extreme-pressure lubricant that is easy to apply.	For gears, cam, reciprocating actions, lathe beds, guides, chains, sprockets, and cables.
Semi-rigid Vinyl	Masland Duran Clad	This vinyl is washable and abrasion resistant and is offered in a wide variety of colors.	The vinyl is laminated to metal sheets which are then formed into products or components.
Aluminum Chain	McKay Welded Aluminum Chain	A non-sparking, non-magnetic, lightweight and corrosion-resistant chain with a working load limit 60 per cent of that of a steel chain of comparable size but weighing 65 per cent less.	Used in the chemical manufacturing, food processing, textile, petroleum refining, and explosives industries.
Die Steel	MC-Mold and Cavity Steel	This steel can be uniformly hardened at hardness ranges from 300 to 350 Brinell through sections as large as 20 by 10 inches. High surface hardness is obtained by carburizing and then oil-quenching.	Available in large rounds or blocks either annealed or heat-treated to a hardness of 300 Brinell. This steel is particularly suitable for molding clear plastics.
Ground Stock	Milford Precision Ground Flat Stock	This ground flat stock which is available in the oil-hardened and air-hardened types has a fine velvet finish. The flat surfaces are parallel and straight, and the edges are ground parallel and square to the ends.	Applications include a great variety of tools and gages.
Hydraulic Oils	Mobil D.T.E. Oils	These eight hydraulic and circulating oils were formulated to provide desired over-all performance with respect to oxidation resistance, protection against rusting and wear, ability to separate from water, and foam resistance.	For use on hydraulically operated equipment and machines employing circulation systems.
Impregnating System	Model 1-24-L Impregnating System	The impregnant is a polyester type resin which "sets" to form a solid structure. It has good wetting properties, assuring good pore penetration.	Developed to correct leakage and internal corrosion caused by microscopic porosity in cast-metal parts.
Cobalt-molybdenum Wire	Molybdenum Wire	The small amount of cobalt added to this high-purity molybdenum base results in minimized wire breakage on grid-winding machines and imparts better stretch properties to the wire.	Used for grid in electronic power and receiving tubes.



## Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Protective Coating	<b>Mono-Seal</b>	This silicon-modified, synthetic-resin coating is smooth and continuous and can be applied using any standard painting procedure or mechanical coating device.	For protecting all types of surfaces, against acid or alkali cleaning solutions, steam, brine, and abrasion.
Titanium Alloy	<b>MST 6A1-4V</b>	A tough alpha-beta titanium alloy which combines good hot strength with stability. It can be readily welded and heat-treated.	For elevated-temperature use. Primarily produced as a bar and forging alloy, but is also used in some sheet and plate work.
Nameplates	<b>Mystery-Cal</b>	Anodized non-etched multicolored foil nameplates with adhesive backings. Nameplates will not pass current across their surfaces.	Suited for extremely fine dials, gages, clock faces, calibrated scales, multicolored instrument panels, and parking meters.
Lead-bearing Steel	<b>New E-Z-Cut</b>	A lead-bearing steel plate that provides good machinability and good welding, polishing, and plating properties. It can be flame-cut, formed, ground, or casehardened.	Available in thicknesses ranging from 1/4 inch to 3 inches. It is used as a general-purpose free-machining material.
Lead-bearing Steel	<b>New Rycut 50</b>	A fine-grained lead-bearing alloy which responds well to the conventional oil-quench and temper method of heat-treatment.	Available in bar form in both the annealed and heat-treated ready-to-use (machine straightened and stress-relieved) forms for brake dies, spindles, collets, gears, etc.
Nickel-alloy Coating Process	<b>Niphos</b>	A nickel-alloy coating which doubles as a brazing alloy. The cladding will not peel or flake if subjected to a 180-degree bend.	For protecting ferrous materials from corrosion and wear. Can provide resurfacing or build-up of worn base metal areas.
Aluminum Casting Alloy	<b>42B</b>	This alloy exhibits a tensile strength of 42,000 psi when cast in a sand mold or 45,000 psi when cast in a permanent mold.	For casting high strength aluminum castings which will replace forgings in aircraft industries.
Aluminum-oxide Abrasive	<b>44 Alundum</b>	An abrasive which has great toughness, high inherent strength, and fine crystal structure. It holds its form, grinds many work-pieces per dressing, and gives a good finish with little heat in grinding wheels.	Used for ball-bearing grinding, honing, centerless, cylindrical and internal precision grinding, saw gumming, snagging and thread grinding.
Bar Stock	<b>60 Case</b>	This hardened and ground bar stock is made from AISI 1060 steel and has a surface hardness of approximately 60 Rockwell C.	Material is used to make guide rods, shafting, rolls, traverse rails, piston rods, arbors, guide posts, mandrels, and spindles.
Adhesive	<b>No. 292 Polyseam</b>	Produces seams which lose all depression tack within twelve to twenty-four hours. Seams do not harden with age but remain soft. The final bond is stronger than the foam itself.	Universal adhesive suitable for rubber, polyurethane, and vinyl foams. Joins foam to wood, hardboard, steel, and aluminum.
Plastics Cement	<b>3799 Metagrip</b>	A clear cement for adhering metalized plastic to itself or to plain plastic without causing the metallic finish to peel or run.	Applied by brush, spray, dip, or squeeze applicators for bonding such materials as metalized acetate, butyrate, or polystyrene.
Nylon Tubing	<b>Nylaflow</b>	A flexible nylon tubing with a burst rating of 2500 psi. It can withstand more than 400 flexes per minute, can be bent to a radius of 2 1/2 inches, and is resistant to alkalies and practically all solvents.	Used on metalworking equipment for conveying lubricants, water, plastic spray, and air.

## Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Nylon Fastenings	Nylo-Fast	Fastenings lock in place and do not loosen under vibration. They resist high voltages at commercial frequencies, withstand heat up to 450 degrees F., and are unaffected by commercial solvents, alcohols, and oils.	These fastenings are offered on an on-hand stock inventory basis and include many of the popular sizes of machine screws.
Cleaning Material	Oakite Aluminum Cleaner No. 164	This material will clean without foaming in agitated tanks. Will also remove difficult soils without agitation.	For removing identification inks, greases, oils, and other heavy soils from aluminum.
Cleaning Material	Oakite Composition No. 117	A solvent detergent which combines thorough cleaning with safety of operation.	Removes grease, oil, and smut from machinery where water cannot be used. No rinse is necessary.
Phosphatizing Compound	Oakite CrysCoat	This compound produces a fine-grained, dense, uniform coating which weighs between 150 and 300 milligrams per square foot.	Used at low temperatures in spray washing machines for coating ferrous metals.
Phosphatizing Compound	Oakite CrysCoat No. 47	Compound removes light oils, grease, spinning compounds, and shop soils and converts surface of steel and iron into a thin, dense coating that resists corrosion and has good paint-adhesion qualities.	This compound imparts an iron phosphate coating of 80 to 120 milligrams per square foot to metal surfaces in metal spray washing machines.
Cleaning Material	Oakite Drycid	This material, supplied in powder form, has a mild aromatic odor and is non-fuming.	For removing corrosion materials from metal surfaces.
Burnishing Compound	Oakite FM 186	An alkaline liquid compound which may be used for self-tumbling or with shot or synthetic media.	It is used to produce a bright finish on and to improve the color of zinc die-castings. It may also be used for burnishing steel and copper.
Cleaning Material	Oakite Liqui-Det	A concentrated liquid detergent which goes into solution quickly and penetrates and loosens most common soils in a very short time.	For general industrial use. It can be used repeatedly without rinsing and will not cause build-up of film or discoloration.
Liquid Detergent	Oakite LSD	Detergent developed to simplify the preparation of steam-cleaning solutions and to reduce the clogging of coils in self-generating steam equipment.	For operations ranging from light to medium-heavy duty. Liquid is safe on steel, brass, and magnesium, and has no adverse effect on painted surfaces.
Stripper	Oakite Stripper S-A	Strips tough finishes in about ten minutes. Paints take from one to five minutes. Also removes light rust, scale, and smut deposits.	This solvent-acid compound was designed to strip high-grade epoxies and other tough finishes from all metals except magnesium.
Tool Steel	Oilgraph-EZ	A tool steel that combines free machinability with good finish. Resists wear and galling in service.	For small drill jig bushings, carbon steel taps, gages, punches, and dies.
Strippable Coating	Onco Protective Covering	Material can withstand 120 hours in a Weatherometer at 140 degrees F.; exposure to rain, sleet, sand, smoke; and handling and shipping hazards.	For protecting fine metal finishes such as stainless-steel finishes for curtain wall use. Leaves no gummy residue when removed.
Bonding Process	Permadizing	A rubber-to-metal bonding process that provides parts that are precise, flash-free, and smooth. Parts exhibit low swell and are resistant to aromatic fuels and hydraulic fluids.	Bonds aluminum to various rubber, synthetic rubber, or silicone compounds. Can also be used for parts operating under extreme conditions.

## Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Stainless-steel Alloys	PH55A PH55B PH55C PH20	A series of corrosion-resistant, precipitation-hardenable, stainless-steel alloys which were formulated for one or more of the following qualities: high strength, high hardness, shock resistance, corrosion resistance, and gall resistance.	For the production of parts requiring the specific qualities inherent in these alloys.
Bendable Tubing	Plica Type A Plica Type B Plica Type C	These three types of bendable tubing serve as electrical conduit. All types can be cut with a hacksaw or knife, bent by hand, and fitted to all standard connectors. It has a high wall strength, is watertight, and may be bent to a sharp radius.	The tubing has a three-ply wall and can be made in almost any desired combination of ferrous and non-ferrous metals, fiber, paper, and other materials.
Rubber Enamel Coating	Pliogard	This synthetic-rubber enamel is a high-solids, chemical-resistant coating which will withstand temperatures up to 250 degrees F. continuously. It does not oxidize and is unaffected by the leakage of hydraulic fluids.	Useful in the automotive field where it is employed to protect and decorate hydraulically operated equipment in automation lines.
Plastic	Polypenco K-51	A plastic having mechanical strength, heat and chemical resistance, dimensional stability, and free machinability. Resists the effects of alkalis and acids.	Available in rod form. It is used for bearings, rollers, gears, pump impellers, valve seats, gaskets, packings, and parts used to control the flow of liquids.
Protective Coating	PSC Protective Coating	This thin transparent coating prevents tarnish, oxidation, corrosion, and stains on silverplate, chromium, steel, aluminum, and other metals. It will not peel, crack, or chip, and can be stamped or hammered.	It can be applied to any shape or form of metal part—plain, embossed, or etched—from wire to sheet.
Nonporous Crystalline Material	Pyroceram	This material, made from glass, is harder than high-carbon steel, lighter than aluminum, and nine times stronger than plate glass. Softening point is 2460 degrees F., flexural strength is 40,000 psi.	Can be formed into large and complex shapes by glassforming techniques. It can also be pressed, drawn, blown, rolled, and centrifugally cast.
Transparent Tape	Rajah	A composite polyethylene-cellophane transparent tape which is dimensionally stable.	Used for the same applications as ordinary cellophane tape.
Epoxy-resin Adhesive	Resiweld	This adhesive is resistant to solvents, grease, water, chemicals, and severe conditions of treatment and exposure. It sets and cures without the use of clamps.	For permanently bonding ferrous and non-ferrous metals, glass, wood, rubber, and plastic surfaces to themselves and to each other.
Aluminum Alloy	Revere Alloy 6263	A lightweight, high-strength, aluminum-alloy conductor material.	Available in both the T6 and T8 tempers. It is used as an electrical conductor material.
Primer for Hard-facing	Roll Matrix	A foundation material for building up carbon-steel parts prior to hard-facing. It eliminates spalling of expensive overlay alloys.	Used for the first step in building up carbon-steel parts which have become excessively worn.
Rubber	RRD-992	A non-porous, super-soft rubber which has a softness characteristic of 5 durometer and can be used in temperatures up to 200 degrees F.	Uses include vibration and shock absorption, noise dampening, airtight and watertight sealing, and electrical insulation.
Paint	Rubber-Coat Liquid Hypalon	A weather-resistant, ozone-resistant, and flame-resistant paint that remains flexible at low temperatures.	May be brushed or sprayed and is used for the identification of pipes, tanks, and chemical equipment.

## Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Protective Coating	Rubber-Coat Liquid Neoprene	This liquid neoprene rubber is suitable for brushing or spraying and provides protection against acids, caustics, and solvents.	It finds ready use in the painting of air-conditioning equipment, louvers, and concrete foundations.
Rust Preventive	Rust Veto M. P.	A water-dilutable rust preventive which is non-toxic, and nonflammable. It may also be mixed with oil or solvent or used straight.	Is used for the protection of metal parts and products that are to be stored indoors.
Greases	Rykon	Made with non-soap organic type thickeners. Are useful where extreme heat or excessive moisture is present. They maintain consistency and structure under severe mechanical working conditions.	Applications include lubrication of electric motor bearings, pumps handling hot liquids, and portable tool gear cases.
Aluminum Alloy	Salloy	A match-plate metal used on jobs where a highly polished surface is required. This alloy is close-grained and takes a good finish.	For making match-plates in the foundry and die-casting industries. It is also used as a casting metal for special applications.
Masking Tape	Scotch Brand Masking Tape No. 214 (Type 2MNB)	A removable masking tape with good resistance to adhesive transfer that withstands temperatures up to 300 degrees F. for eight hours.	For elevated temperature use, it is used to mask treated as well as plain metal surfaces.
Expansible Compounds	Scotchfoam Brand Expansible Compound Type A and Type I	These foams are adapted to filling cavities where light weight, structural strength, stiffening, vibration dampening, and durability are desired.	For insulating and reinforcing of voids in aircraft-tail assemblies and other structures and providing sound deadening and insulation on railroad passenger cars.
Fasteners	Silicon Bronze Fasteners	The fasteners which include hexagon-head screws, nuts, and washers resist sub-zero temperatures.	Used as fasteners in the assembly of radar domes in the Distant Early Warning system.
Plastic Molding	Silvatrim	Consists of a metal foil locked-in and laminated between two pieces of clear plastic. The material is dimensionally stable, and resists heat and corrosion.	Serves as a protective finishing for the edges of glass, wood, or spun metal.
Beryllium-copper Wire	Silvercote Tempered Beryllium-Copper Wire	This wire has an ultimate tensile strength of 185,000 psi and is sufficiently ductile to be wrapped around its own diameter. It is corrosion-resistant, electrically conductive, non-magnetic, and silver plated.	For forming into strings, wire rope, and complex shapes. The silver plating allows easy soldering and provides low-resistance electrical contact.
Solid Film Lubricant	Solid Film Lubricant No. 2006	Its coefficient of friction has been measured to be as low as 0.022 under high loads at 550 degrees F.	Normally used up to 800 degrees F. for the prevention of galling and seizing of threaded parts and fasteners.
Glass-cleaning Abrasive	Steeletts	A steel-grit abrasive that has the same hardness range as chilled iron abrasives but is free from brittle carbides. Abrasive particles do not chip upon contact, and their shape endures for hundreds of cycles.	Used to provide a deep etch on metallic surfaces for bonding, to provide luster on non-ferrous work, and for descaling alloy forgings and heat-treated work.
Tool Steel	Stentor	An oil-hardening, non-deforming tool steel that can now be hardened safely over a broader temperature range. Other properties include freedom from decarburization, minimum size change, uniform hardenability, and no necessary preheating.	Applications include dies for blanking, forming, molding, laminating, and trimming; broaches; collets; stamps; spindles; master taps; and thread gages.



## Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Polystyrene Plastics	Styron 429, 440, 665, and 689	A group of four polystyrene compounds that possess one or more of the following properties: good surface finish, high flexural strength, heat resistance, impact strength, moldability, and chatter and crack resistance.	For vacuum forming of products in thin extruded sheets; for molding radio cabinets, housings, etc.; for general shape extrusions; and also for high-speed automatic molding operations of large cross-sectional area parts.
Cutting Oil	Sunicut 85	This oil is transparent, has a low viscosity, can easily be pumped, has high heat absorption, quickly wets metal, provides extreme pressure lubrication and rust prevention.	This heavy-duty, sulphurized cutting oil is used for production threading of tubing, pipe and couplings made from high-alloy steels.
Aluminum-bronze Alloy	Superston 40	This alloy has a high yield strength, great toughness, and a long fatigue life. It can be easily cast and readily forged, rolled, or extruded.	Used for slippers in steel mills, condenser tube plates, nuts and bolts, rods, tubes, and welding rods.
Threading and tapping Lubricant	Tapit	This lubricant reduces the risk of tap breakage. It can be used on titanium and stainless steel.	Other operations in which the lubricant is used include drilling, reaming, sawing, boring and broaching.
Teflon Discs	Teflon Discs	A line of flat circular Teflon discs in even-numbered sizes from 4 to 18 inches in diameter, in thicknesses of 1/16 and 1/8 inch.	Use of these discs results in savings from the elimination of waste on corners when regular sheet material is employed.
Tubing and Rod	Teflon Tubing and Rod	This flexible tubing and rod exhibits chemical inertness and a low coefficient of friction, and may be used in a temperature range of -455 degrees F. to +550 degrees F.	Can be obtained cut to lengths to meet specific needs in the aviation, electronic, electrical, and automotive industries.
Nylon Pipe	Tempertube	A non-toxic nylon pipe which has a high bursting strength and the ability to withstand high temperatures.	Wherever a high bursting strength and high temperature use is indicated.
Temperature Indicator	Tempil® Pellet for 100 Degrees F.	These temperature-indicating pellets liquefy along the line of contact between the pellet and the surface when the surface reaches a temperature of 100 degrees F.	For testing the effectiveness of insulations, regulating heating and cooling systems, testing prototypes for heat-transfer characteristics, and testing work in the production line.
Coolant	Texaco Soluble Oil HD	A heavy-duty emulsive coolant with extreme-pressure properties. Mixes readily with hard or soft water to form a highly stable emulsion with good rust-inhibiting properties.	Used with carbide and high-speed steel tools in automatic operations and, in many instances, in place of a cutting oil.
Vinyl-coated Metal	Texkote	Aluminum and steel in attractively textured and colored finishes in gage thicknesses of from 18 to 30. Coatings have high abrasion and electrical resistance and are not affected by heat or humidity.	Can be deep-drawn roll-formed, punched, etc., without damage. Used for carrying cases, luggage, appliances, automotive and aircraft trim.
Surface Preparation	Totrust Metal-Bond (Clear)	A clear metal coating which assures adhesion of paint films to smooth surfaces such as galvanized sidings, aluminum sheets, and painted signs. When dry, it acts as an adhesive for paints and also as a protective coating.	Applicable by brush or spray to surfaces that are dry and free of grease, oil, and loose particles. Besides metal surfaces, it can be used on bare wood, plastic, wallboards, and cement-asbestos board.

## Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Cutting Oil	Transultex Cutting Oil B HD	An easily removable, extreme-pressure cutting oil that is transparent. Transparency facilitates visual inspection of pieces undergoing machining.	For use in practically all cutting, broaching, threading, and similar operations.
Abrasive Spheres	Tumblers S	These spheres, available in five different diameters, are made of Norton Alundum, aluminum oxide and are used for finishing hard-to-contact recesses or intricate shapes.	Proved satisfactory for finishing tubing, coil springs, scissors handles, bearing retainers, and pump bodies.
Barrel-finishing Abrasives	Tumblers T Tumblers N	Two abrasives—the T-formulation consisting of triangular-shaped pieces of Alundum vitrified-bonded abrasive which was developed to overcome the problem of wedging of abrasive in parts being tumbled. Tumblers N, which cuts slowly, has little breakdown and produces a bright color and luster.	For fast barrel cutting without the use of cutting compounds. Used on die-castings and on steel, zinc, brass, aluminum, and stainless-steel parts.
Babbitt Metals	Turbo-Glyco Marine Glyco Standard Glyco Transmission Glyco Heavy-Pressure Mill Glyco	These bearing metals have a fine grain structure, low frictional qualities, and retain strength at high operating temperatures. They are free-flowing, unharmed by overheating, free from dross, and re-usable.	For all types of bearing applications. The trade names give an indication of the particular field in which these bearing metals are used.
Stainless Steel	Type 201	An austenitic steel which when annealed has a yield strength of 50,000 psi and a tensile strength of 115,000 psi. It can be welded by all of the conventional methods and may be fabricated by bending, forming, and drawing.	Used for structural members and siding and roofing for railway cars and trailers and some architectural applications.
Stainless-steel Tubing	Types 304 and 321 Weldrawn	Obtainable in outside diameters up to 2 1/16 inches. Wall thicknesses range from 0.006 to 0.025 inch.	For making bellows, low-pressure heat-exchanger tubes, flexible hose, aircraft ducting, fractional-horsepower motor casings, ceramic drills, etc.
Nickel Alloy	Udimet 500	A centerless-ground hot-rolled nickel-alloy bar stock which has an ultimate tensile strength of 160,000 psi at 1350 degrees F. Average hardness, as heat-treated, is 38 to 40 on the Rockwell C scale.	Available in sizes from 1/2 inch to 2 inches in diameter. This alloy has been developed for use as gas-turbine components and other parts requiring strength at elevated temperatures.
Air-hardening Steel	VascoJet 1000	A 5 per cent chromium air-hardening steel with a tensile strength of from 250,000 to 300,000 psi. Exhibits good notch toughness, fatigue life, and is free from residual stress.	Applications include landing-gear components, engine mounts, air frames, skins for aircraft; light-weight railroad cars; and truck parts.
Silicone Lubricants	Versilube F-50 Versilube G-300	These compounds lubricate about as well as petroleum oils and greases and yet retain all the typical silicone characteristics—such as an operating temperature range of from minus 100 to plus 400 degrees F. The F-50 compound is a fluid, and the G-300, a grease.	Suitable for use in hot industries such as the glass, steel, ceramics, and petroleum industries. Also applicable to sleeve-bearing and ball-bearing motors, clocks, timers, instruments, etc.
Gage and Die Steels	VULground	These oil-hardening and air-hardening types of steels are precision ground to a high finish and are available in standard 18- and 36-inch lengths.	Available in a wide range of thicknesses and widths. They are used for many gage and die applications.

## Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Mounting Material	Waffle-Grip Elasto-Rib	The materials have good vibration-, shock-, and noise-absorbing qualities.	Pad type machinery mountings for all types of machinery.
Bonding Process	Weldalloy A Weldalloy B	A process that joins carbide to steel in a union strong enough to withstand almost any punch-press operation without separating the intermediary alloy from either the carbide or steel.	Weldalloy A materials are used as intermediate material between carbide and steel and Weldalloy B materials are used as casing materials to reinforce carbide inserts.
Magnet Material	Westinghouse Magnet Material	A virtually 100 per cent pure manganese-bismuth which is embedded in a plastic matrix. This material is unusually resistant to demagnetization.	For making various shapes of permanent magnets, even wafers or discs. Magnets can be machined readily and are nonconductors of electricity.
Abrasive Cloth	Wetordry Fabricut	A "self-cleaning" cloth mesh coated on both sides with mineral grain bonded to the cloth with a heat-resistant waterproof resin.	Can be used for either wet or dry, hand or machine sanding.
Coating Process	Whirlclad	A method of coating metals, ceramics, glass, and wood with various types of plastic materials. No plasticizers or solvents are used. Coating thickness ranges anywhere from 0.008 to 0.040 inch.	For coating such wear parts as jigs and fixtures, rollers, bushings, loading hooks, sliding surfaces and such corrosion-resistant parts as valve bodies, fans, and ducts.
Woven Plastic	Woven Teflon	This very slippery material is used as a facing material on the wear surfaces of automotive suspension joints.	Other uses include spherical parts such as rod ends and ball-socket joints for special controls and self-aligning bearings; cylindrical parts such as seals, bushings, pistons, and sleeve bearings for all types of machinery.
Silicone Lubricants	X-520 X-521 X-522 X-525 X-526 X-527	Lubricants exhibit unusual lubricating and solubility properties, have good release properties, are stable, and lubricate and impart anti-wear properties in a manner similar to petroleum oils.	Used as special lubricants, as release agents for rubber and plastics, and as emulsifying agents or emulsion breakers.

## Names and Addresses of Manufacturers of Products Listed

Alcoa Alloy X6463—Aluminum Company of America, 1501 Alcoa Bldg., Pittsburgh 19, Pa.	Apex 417—Apex Smelting Co., 2537 W. Taylor St., Chicago, Ill.	CA-606 and CA-609—Carnet Division of Allegheny Ludlum Steel Corp., Pittsburgh 22, Pa.
Alcoa Solder No. 805 and Alcoa Soldering Flux No. 66—Aluminum Company of America, 1501 Alcoa Bldg., Pittsburgh 19, Pa.	Bear Penetrating Oil—House of Laurila, 18483 Braile, Detroit, Mich.	Ceralox OX-12—Adamast Carbide Corp., Kenilworth, N. J.
Alcoa Soldering Sheet—Aluminum Company of America, 1501 Alcoa Bldg., Pittsburgh 19, Pa.	Beryllium-Copper Strip—American Silver Co., Inc., 3607 Prince St., Flushing 54, N. Y.	Chromewear—Vanadium-Alloys Steel Co., Latrobe, Pa.
All-State No. 105 Medium-Temperature Solder and All-State No. 107 General-Purpose Silver Solder—All-State Welding Alloys Co., Inc., 249-55 Ferris Ave., White Plains, N. Y.	Blue Label Stainless-Steel Wire, Type 302—Webb Wire Division, Carpenter Steel Co., New Brunswick, N. J.	Class 700—Silicone Products Department, General Electric Co., Watford, N. Y.
AlSiMag 491 Ceramic—American Lava Corp., Chattanooga, Tenn.	"Bondized" Califilm and "Bondized" Kelon-F—Shamban Engineering Co., 11617 W. Jefferson Blvd., Culver City, Calif.	Climax Molybdenum-Base Alloys—Climax Molybdenum Co., 500 Fifth Ave., New York 36, N. Y.
AM350—Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.	Bondmaster M620—Rubber & Asbestos Corp., 225 Belleville Ave., Bloomfield, N. J.	Coast Metals 50—Coast Metals, Inc., Little Ferry, N. J.
	Boral—Aluminum Company of America, 1501 Alcoa Bldg., Pittsburgh 19, Pa.	Cohrlastic HT 655 and HT 666—Connecticut Hard Rubber Co., 407 East St., New Haven, Conn.

## Review of Some Recently Developed Materials—Continued

### Names and Addresses of Manufacturers of Products Listed

- Colmonoy No. 70—Wall Colmonoy Corp., 19345 John R St., Detroit 3, Mich.
- Colorweld—Reynolds Metals Co., 2500 S. Third St., Louisville, Ky.
- Compo-E—Bound Brook Oil-Less Bearing Co., Bound Brook, N. J.
- Conner Spherical Corners—Conner Steel Products 24690 Telegraph Road, Detroit 19, Mich.
- Devcon F—Chemical Development Corp., Danvers, Mass.
- Devonseal No. 12—Devon Tape Corp., 519 S. Fifth Ave., Mount Vernon, N. Y.
- Ductile Ni-Resist—International Nickel Co., 67 Wall St., New York 5, N. Y.
- Dynel—Textile Fibers Department, Carbide Chemicals Co., Division of Union Carbide Corp., 30 E. 42nd St., New York 17, N. Y.
- Enflon—Englo Corp., Route 38 at Airport Circle, Pennsauken, N. J.
- Enthocolor 220—Enthone, Inc., 442 Elm St., New Haven, Conn.
- Epocast and Epocast 13—Furane Plastics Inc., 4516 Brazil St., Los Angeles 39, Calif.
- F132—Aluminum Company of America, 1501 Alcoa Bldg., Pittsburgh 19, Pa.
- Fatigue Proof—LaSalle Steel Co., 1412 150th St., Hammond, Ind.
- Fernicklon—National - Standard Co., Niles, Mich.
- Fire Curtain Belts—B. F. Goodrich Industrial Products Co., Akron, Ohio
- Firthe NHA—Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
- Flame-Plating—Linde Co., Division of Union Carbide Corp., 30 E. 42nd St., New York 17, N. Y.
- Fleetweld 5-P—Lincoln Electric Co., 22801 St. Clair Ave., Cleveland 17, Ohio
- Flintlok 40, 41 and 42 and Tufkote 20, 21, 22, 23, and 24—Auburn Button Works, Inc., Auburn, N. Y.
- G-E Textolite (R) Cold Punch 11570—General Electric Co., Chemical & Metallurgical Division, Pittsfield, Mass.
- GMR-235—Haynes Stellite Co., Division of Union Carbide Corp., 30 E. 42nd St., New York 17, N. Y.
- Grade 330 and 860—Metallurgical Products Department, General Electric Co., Detroit 32, Mich.
- H-560 Flux—Lincoln Electric Co., 22801 St. Clair Ave., Cleveland 17, Ohio
- Habcool 318 Tapping Oil—H. & B. Petroleum Co., 799 E. 25th St., Paterson 4, N. J.
- Handy Alumibraz—Handy & Harman, 82 Fulton St., New York 38, N. Y.
- Harvey Hollow Bar—Harvey Aluminum, 19200 Southwestern Ave., Torrance, Calif.
- Heller Nucut—Heller Tool Co., Newcomerstown, Ohio
- Hi-C 60—Western Carbide Corp., 6840 Vineland Ave., North Hollywood, Calif.
- Hi-Qua-Led Steel—Alco Products, Inc., Box 1065, Schenectady 5, N. Y.
- HM21XA-T8—Dow Chemical Co., Midland, Mich.
- Hot-Melt H-883-A—Furane Plastics Inc., 4516 Brazil St., Los Angeles 39, Calif.
- Hypercut XX—Destiny Products Co., 2970 W. Grand Blvd., Detroit 2, Mich.
- Impco RC-2—Impco, Inc., Cranston, R. I.
- Irus Fluid 902—Shell Oil Co., 50 W. 50th St., New York 22, N. Y.
- Jet-Cut No. 9 and Flo-Cut No. 15—Regal Division of Beloit Tool Corp., P. O. Box 30, Beloit, Wis.
- Jetweld LH-70—Lincoln Electric Co., 22801 St. Clair Ave., Cleveland 17, Ohio
- K501—Kennametal Inc., Latrobe, Pa.
- Kenface—Kennametal Inc., Latrobe, Pa.
- Kenvert Chrome Sealer Type Films—Conversion Chemical Corp., Rockville, Conn.
- Klemp Rectangular Riveted (RR) Aluminum Grating—Klemp Metal Grating Corp., 6601 S. Melvina, Chicago 38, Ill.
- Laminol—American Nickeloid Co., Peru, Ill.
- LaSalle Large Hexagon—LaSalle Steel Co., P. O. Box 6800A, Chicago, Ill.
- Levelume—Hanson - Van Winkle - Munning Co., Matawan, N. J.
- Loctite—American Sealants Co., Trinity College, P. O. Box 260, Hartford 6, Conn.
- M-252—Metallurgical Products Department, General Electric Co., Detroit 32, Mich.
- Marla Spray Lubricant—Rothlan Corp., 3618 Laclede Ave., St. Louis, Mo.
- Masland Duran Clad—Masland Dural-leather Co., Philadelphia 34, Pa.
- McKay Welded Aluminum Chain—McKay Co., 323 McKay Bldg., Pittsburgh 22, Pa.
- MC-Mold and Cavity Steel—Vanadium-Alloys Steel Co., Latrobe, Pa.
- Milford Precision Ground Flat Stock—Henry G. Thompson & Son Co., New Haven, Conn.
- Mobil D.T.E. Oils—Socony Mobil Oil Co., Inc., 26 Broadway, New York 4, N. Y.
- Model 1-24-L Impregnating System—American Metaseal Mfg. Corp., West New York, N. J.
- Molybdenum Wire—Fansteel Metallurgical Corp., North Chicago, Ill.
- Mono-Seal—Mono-Seal Division of Downer-Hunnewell, Inc., 6 Long Wharf, Boston 10, Mass.
- MST 6A1-4V—Mallory-Sharon Titanium Corp., Niles, Ohio
- Mystery-Cal—North Shore Nameplate, Inc., 214-27 Northern Blvd., Bay-side 61, N. Y.
- New E-Z-Cut and New Rycut 50—Joseph T. Ryerson & Son, Inc., Box 8000-A, Chicago 80, Ill.
- Niphos—Tube Reducing Corp., Wallington, N. J.
- 42B—North American Aviation, Inc., International Airport, Los Angeles 45, Calif.
- 44 Alundum—Norton Co., Worcester 6, Mass.
- 60 Case—Thomson Industries, Inc., Manhasset, N. Y.
- No. 292 Polyseam—Anchor Adhesives Corp., 36-23 164th St., Flushing, N. Y.
- 3799 Metagrip—Adhesive Products Corp., 1660 Boone Ave., New York 60, N. Y.
- Nylaflo—Polymer Corp. of Pennsylvania, 125 N. 4th St., Reading, Pa.
- Nylo-Fast—Anti-Corrosive Metal Products Co., Inc., 1234 River Road, Castleton-on-Hudson, N. Y.
- Oakite Aluminum Cleaner No. 164—Oakite Products, Inc., 126 Rector St., New York 6, N. Y.
- Oakite Composition No. 117—Oakite Products, Inc., 126 Rector St., New York 6, N. Y.



## Review of Some Recently Developed Materials—Continued

### Names and Addresses of Manufacturers of Products Listed

- Oakite CrysCoat LT—Oakite Products, Inc., 126 Rector St., New York 6, N. Y.
- Oakite CrysCoat No. 47—Oakite Products, Inc., 126 Rector St., New York 6, N. Y.
- Oakite Drycid—Oakite Products, Inc., 126 Rector St., New York 6, N. Y.
- Oakite FM 186—Oakite Products, Inc., 126 Rector St., New York 6, N. Y.
- Oakite Liqui-Det—Oakite Products, Inc., 126 Rector St., New York 6, N. Y.
- Oakite LSD—Oakite Products, Inc., 126 Rector St., New York 6, N. Y.
- Oakite Stripper S-A—Oakite Products, Inc., 126 Rector St., New York 6, N. Y.
- Oilgraph-EZ—Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh 22, Pa.
- Onco Protective Covering—Onco Products Inc., 201 S. Main St., Middletown, Ohio
- Permadizing—Stillman Rubber Co., 5811 Marilyn Ave., Culver City, Calif.
- PH55A, PH55B, PH55C, and PH20—Research Division, Cooper Alloy Corp., Hillside, N. J.
- Plica Types A, B, and C—Flexaust Co., Division of Callahan Zinc-Lead Co., Inc., 100 Park Ave., New York 17, N. Y.
- Pliogard—Saran Protective Coatings Co., 2415 Burdette Ave., Ferndale 20, Mich.
- Polypenco K-51—Polymer Corp. of Pennsylvania, Reading, Pa.
- PSC Protective Coating—PSC Inc., 303 Fifth Ave., New York, N. Y.
- Pyroceram—Corning Glass Works, Corning, N. Y.
- Rajah—General Tape Corp., First National Bank Bldg., St. Paul 1, Minn.
- Resiweld—H. B. Fuller Co., 181 W. Kellogg Blvd., St. Paul 2, Minn.
- Revere Alloy 6263—Revere Copper & Brass Inc., 230 Park Ave., New York 17, N. Y.
- Roll Matrix—All-State Welding Alloys Co., Inc., 249-55 Ferris Ave., White Plains, N. Y.
- RRD-992—Roth Rubber Co., 1860 S. 54th Ave., Chicago 50, Ill.
- Rubber-Coat Liquid Hypalon—Wilbur & Williams Co., 130 Lincoln St., Boston 35, Mass.
- Rubber-Coat Liquid Neoprene—Wilbur & Williams Co., 130 Lincoln St., Boston 35, Mass.
- Rust Veto M. P.—E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.
- Rykon—Standard Oil Co. (Indiana), 910 S. Michigan Ave., Chicago 80, Ill.
- Salloy — Metallurgical Department, George Sall Metals Co., 2300 E. Butler St., Philadelphia 37, Pa.
- Scotch Brand Masking Tape No. 214 (Type 2MNB)—Minnesota Mining & Mfg. Co., Dept. L7-132, St. Paul, Minn.
- Scotchfoam Brand Expandable Compound Type A and Type 1—Adhesives and Coatings Division, Minnesota Mining & Mfg. Co., 423 Piquette Ave., Detroit 2, Mich.
- Silicon Bronze Fasteners—Cleveland Cap Screw Co., 3002 E. 79th St., Cleveland 4, Ohio
- Silvatrim—Glass Laboratories, Inc., 65th St. at 9th Ave., Brooklyn 20, N. Y.
- Silvercote Tempered Beryllium-Copper Wire—Little Falls Alloys, Inc., 189 Caldwell Ave., Paterson, N. J.
- Solid Film Lubricant No. 2006—Electrofilm, Inc., P. O. Box 106, North Hollywood, Calif.
- Steeletts—Wheelabrator Corp., 1147 S. Byrkit St., Mishawaka, Ind.
- Stentor—Carpenter Steel Co., 101 W. Bern St., Reading, Pa.
- Styron 429, 440, 665, and 689—Dow Chemical Co., Midland, Mich.
- Sunicut 85—Sun Oil Co., 1608 Walnut St., Philadelphia 3, Pa.
- Superston 40—Superston Corp., 230 Park Ave., New York 17, N. Y.
- Tapit—DoALL Co., 254 N. Laurel Ave., Des Plaines, Ill.
- Teflon Discs—Allegheny Plastics, Inc., Box T, Corapolis, Pa.
- Teflon Tubing and Rod—Pennsylvania Fluorocarbon Co., Inc., 1115 N. 38th St., Philadelphia 4, Pa.
- Tempertube—Danielson Mfg. Co., Danielson, Conn.
- Tempil Pellet for 100 Degrees F.—Tempil Corp., 132 W. 22nd St., New York 11, N. Y.
- Texaco Soluble Oil HD—Texas Co., 135 E. 42nd St., New York 17, N. Y.
- Texkote—Sun Steel Co., 1702 W. 74th St., Chicago 36, Ill.
- Totrust Metal-Bond (Clear)—Wilbur & Williams Co., 130 Lincoln St., Boston, Mass.
- Transultex Cutting Oil B HD—Texas Co., 135 E. 42nd St., New York 17, N. Y.
- Tumblers S—Norton Co., Worcester 6, Mass.
- Tumblers T and N—Norton Co., Worcester 6, Mass.
- Turbo-Glyco, Marine Glyco, Standard Glyco, Transmission Glyco, Heavy-Pressure Mill Glyco—Joseph T. Ryerson & Son, Inc., Box 8000-A Chicago 80, Ill.
- Type 201—Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh 22, Pa.
- Types 304 and 321 Weldrawn—Superior Tube Co., Germantown Ave., Norristown, Pa.
- Udimet 500—Utica Drop Forge & Tool Corp., Utica, N. Y.
- VascoJet 1000—Vanadium-Alloys Steel Co., Latrobe, Pa.
- Versilube F-50 and G-300—Silicone Products Department, General Electric Co., Waterford, N. Y.
- VULground—Vulcan Crucible Steel Division, H. K. Porter Co., Inc., 300 Park Ave., New York 22, N. Y.
- Waffle-Grip Elasto-Rib—Korfund Co., Inc., 48-39M 32nd Place, Long Island City 1, N. Y.
- Weldalloy A and B—Welded Carbide Tool Co., Inc., 62-68 Colfax Ave., Clifton, N. J.
- Westinghouse Magnet Material—Westinghouse Electric Corp., Box 2278, Pittsburgh 30, Pa.
- Wetordry Fabricut—Minnesota Mining & Mfg. Co., 900 Fauquier St., St. Paul 6, Minn.
- Whirlclad—Polymer Processes Inc., Reading, Pa.
- Woven Teflon—E. I. duPont de Nemours & Co. (Inc.), Wilmington 98, Del.
- X-520, X-521, X-522, X525, X526, and X-527—Linde Co., Division of Union Carbide Corp., 30 E. 42nd St., New York 17, N. Y.

# Air Gaging Finds Many Uses at Bullard

HARRY R. McCUE, Quality Control Manager  
Bullard Co., Bridgeport, Conn.

**A**FTER redesigning its entire line of machine tools recently, the Bullard Co. turned to air gaging as a standard precision checking medium for both parallel and tapered work. Tolerances were squeezed at first to plus or minus 0.0005 inch. Today, tolerances on finish-ground parts are held, where necessary, to plus or minus 0.00015 inch. Lack of play between mating parts has contributed materially to the elimination of chatter in machines operating at high speeds and under heavy loads. In addition to improving part quality, the new technique has lowered production costs by reducing rework and salvage operations. Also, hand fitting and polishing have been reduced to a minimum.

Tapers are no longer checked by the accepted method of applying machinist's bluing to the work, then fitting a tapered plug or ring gage to the dyed surface. Although tapers appeared satisfactory, frequently, after removing the part from the machine, further inspection revealed an out-of-tolerance condition. To set up the part in the machine, pick up the original taper and then rework it was difficult, and sometimes impossible. With air-gaging methods, all tapers are known to be accurate before the parts are pulled from the machine.

Some other advantages of air-gaging tapers

that have been realized are: out-of-roundness can be checked by turning the work-piece and noting the movement of the gage pointer; in addition to revealing a correct or incorrect taper, the amount of variation can be seen; and last but not least, speed of gaging.

Equipment for checking an internal angle of taper can be seen in Fig. 1. It consists of a combination of two Dimensionair units, manufactured by the Federal Products Corporation, connected to a tapered air plug. The gages used are dual units having a common air supply and a common air-pressure regulator. In the tapered plug are two pairs of air jets that measure the work diameter at two points along the taper. Each pair of jets is connected to an individual air meter.

To set the gages, the tapered air plug is inserted into a tapered master (illustrated) to a predetermined depth. Both pointers on the gages are then set to a zero reading. The tapered plug is inserted into the bore of the work-piece, and any variation in bore taper between the work and the master can be read directly on the dial scales of the air-gage units.

So that accurate repetitive readings can be obtained, it is important that the tapered plug be inserted to exactly the same depth for each

Fig. 1. Inserting a tapered plug into a master to zero the air gages. The plug contains two pairs of air jets to determine the diameter at two points.

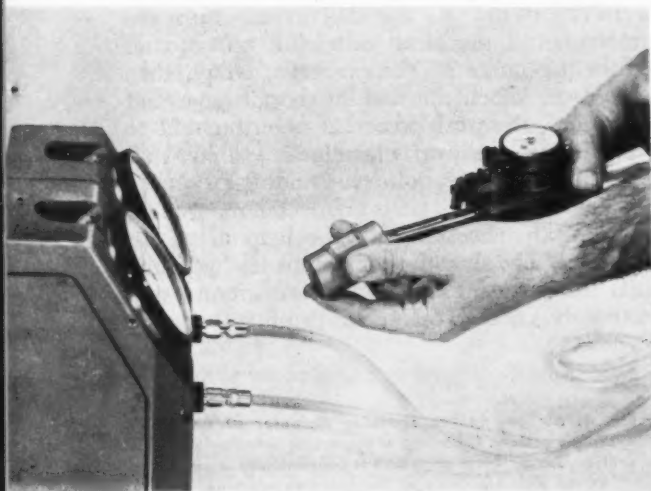


Fig. 2. A special C-frame assembly is employed to check external taper. The frame holds two pairs of jets for measuring the taper at two points.

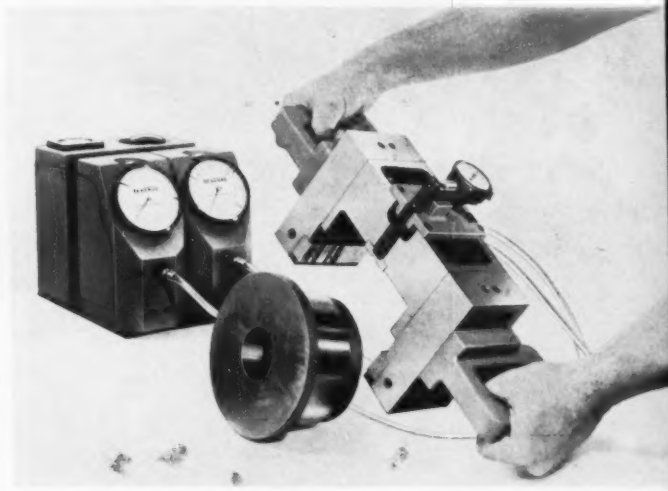




Fig. 3. Gaging unit, mounted in front of the grinding wheel, is connected to an air gage (upper right) to give continuous precise measurements of plunge grinding.

check. To be certain of this, a dial indicator is provided on the handle of the air plug assembly. Using the face of the work-piece as a reference point, the plug is inserted until the dial indicator registers zero. Tolerances for many of the tapers are very close. For example, on the smaller diameter of milling machine tapers a tolerance of plus 0.0003 minus 0.0000 inch is held. The larger diameter tolerance is even closer.

External tapers are gaged along the same principles as internal tapers even though the gaging fixture bears no resemblance. A specially

designed C-frame assembly is being used to measure an external taper in Fig. 2. The frame, like the tapered plug, contains two pairs of jets and measures the work diameter at two points. A dial indicator mounted on the frame again insures that the gage is measuring the diameter at the proper location on the taper. The C-frame has positive seating on the work-piece.

Air gaging is also being used on cylindrical and straight work such as parts being ground on internal, external, centerless, and surface grinding machines. On external cylindrical grinding machines, air gages are being used in conjunction with Arnold gages to measure the extent of plunge grinding. A standard dial-indicator type grinding gage is equipped with an Arnold air attachment that allows it to be used with an air gage, Fig. 3.

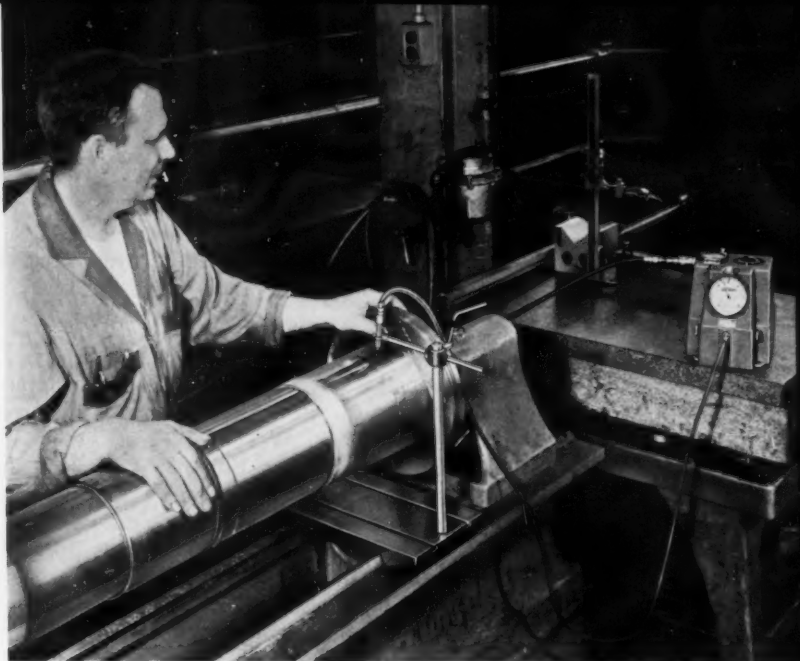
An output shaft for a horizontal boring mill is being plunge-ground to a diameter of 1.7717 to 1.7720 inches. As the dial indicator on the attachment approaches zero, the part comes within the range of the air gage, which then takes over. When the dial on the air gage unit reads zero, the work-piece has been brought to size. Because the work diameter is visible at all times, there is no fear of over-grinding.

A number of small parts are centerless ground, then quickly checked with the help of an air snap gage. The shoulders of pistons for hydraulic units of vertical turret lathes are ground and accurately checked at the rate of 200 to 300



Fig. 4. Air gaging the shoulder diameter of small hydraulic pistons following a centerless grinding operation. An air snap gage unit is conveniently located at the discharge side of the grinding machine.

**Fig. 5. A 5-inch diameter spindle sleeve is rotated on centers and checked for runout with an Air-Probe. Total runout must not exceed 0.0002 inch.**



pieces per hour, Fig. 4. A tolerance of plus 0.0000 minus 0.0003 inch is held on the 0.1873-inch diameter shoulder. An estimated production increase of 40 to 50 per cent has been realized since this gaging procedure was instituted.

Air gaging is also being used to check precision parts for conformance to runout specifications. In Fig. 5 can be seen a 5-inch diameter spindle sleeve for a horizontal boring mill. As it is rotated between centers, an AirProbe and gage indicate the runout of the spindle sleeve.

The total runout cannot exceed 0.0002 inch along the entire length of the part.

The quality control department is responsible for all gages, measuring heads, and masters. All gages and accessories, such as heads and probes, are checked periodically, and detailed records are maintained. This continuous checking is the foundation of the gage control phase of the quality control program. If a unit or gage loses its original accuracy, it is removed from the active gage list and corrected.

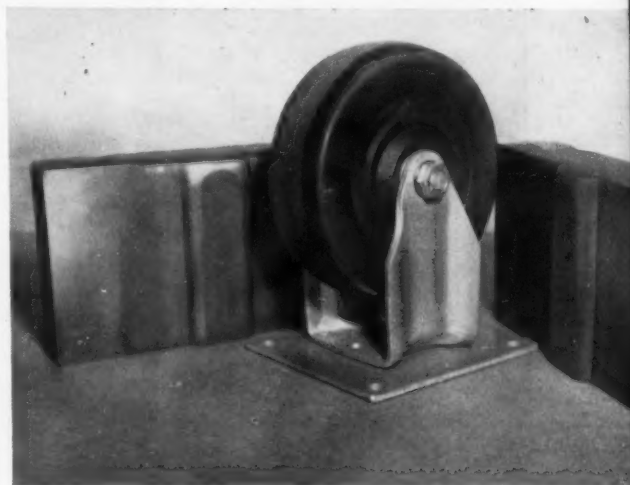
## Caster Bracket Dies are Flame-Plated

Flame-Plating increases the life of dies used to shape the side-plates of caster brackets at the Bassick Co., Bridgeport, Conn. The process also makes possible a better product by eliminating scoring of the bracket blanks by the dies. Flame-Plated dies have produced over 15,000 unscored brackets.

Developed by the Linde Co., a Division of Union Carbide Corporation, Flame-Plating consists of depositing a thin coating of tungsten carbide or aluminum oxide on metal surfaces by means of controlled detonation. Since the temperature at the plated surface reaches only about 400 degrees F., there is little danger of dimensional or metallurgical change in the part. On parts such as feed dogs or anvil blocks no finishing is necessary, as the resulting surface roughness measuring 125 micro-inches is considered satisfactory.

The low porosity and extreme hardness of the

Flame-Plated coating make it useful on parts that are subject to abrasion. The wear life of aluminum can be lengthened so that the metal can be utilized for applications that require both light weight and long wear.



**This caster bracket was shaped by dies that had been Flame-Plated with a 0.004-inch coating of tungsten carbide.**



# Interrupted Cutting with Carbide

MILTON G. JENSEN, Methods Engineer  
Pratt & Whitney Co., Inc.  
West Hartford, Conn.

A UNIQUE tool geometry solved the problem of applying carbide to interrupted internal cutting at Pratt & Whitney, West Hartford, Conn. The tool was developed on a Bullard 36-inch Cutmaster vertical turret lathe. The work-piece, seen in Fig. 1, is a molybdenum-steel forging having a Brinell hardness of 200 in soft condition and heat-treated to a Brinell hardness of 371 to 400 before finishing. Three intermittent cuts are involved: one surface is an arc of 80 degrees on a 12 1/2-inch diameter; another surface is an arc of 210 degrees on an 11-inch diameter; and the third, a groove on an 11 1/2-inch diameter.

It was decided to use butt-brazed tools to give greater depth of carbide under the cutting edge, because of the high impact. Shanks were made from cold-rolled steel, and were sandwich-brazed. A clearance angle of approximately 10 degrees was milled on the shank. Throughout the entire development and consequent production, not a single braze failure has occurred.

With conventional clearances of 5 to 7 degrees and rake angles from 10 degrees positive to 10 degrees negative, a variety of carbide grades, run at a variety of feeds and speeds, did not produce one instance where a tool stood up through a cut without chipping or burning at the edge.

Development to this point was not a complete loss, however. It was found that a negative rake of 5 to 10 degrees lessened the amount of chipping, but induced chatter because of lack of rigidity. In addition, it was found that a positive rake tended to stabilize the tool in the cut and thus prevent chatter; but chipping occurred almost immediately.

It was then decided to combine in one tool the advantages afforded by a positive rake and those afforded by a negative rake. First, a tool was ground with 5 degrees positive rake, 0.090-inch nose radius, and 15 degrees end cutting edge angle. Next, negative rake in the form of a 30-degree chamfer, 0.030 inch wide, was ground on the side cutting edge, around the nose radius, and along the end cutting edge. Since the 30-degree negative rake increased the included angle of the cutting edge, it was felt that the tool could be given more clearance. This was increased to 10 degrees, leaving a cutting edge with an included angle of 110 degrees.

This tool geometry proved successful from the start, since there was no chatter and no chipping at the cutting edge. It removed 0.050 to 0.075 inch depth of metal from the 11 1/2-inch diameter and plunged into 3/4-inch shoulders to a depth of 1/8 inch. Cutting was at the rate of 200 sfm (surface feet per minute) at a feed of 0.005



Fig. 1. The work is shown in its fixture on the vertical turret lathe after the rough intermittent cuts have been completed.

ipr (inch per revolution). The chip was cherry red with about 50 per cent compression. Both tool and work-piece remained extremely cool, although the cutting edge was red when it left the work-piece. There was no welding of metal to the tool whatsoever.

Next, this geometry was applied to a 3/4-inch wide grooving tool, with a 0.090-inch radius at each corner. The chamfer on the end of the tool was reduced to 20 degrees, but remained 30 degrees on the radii, reducing the impact upon entering the cut. Metal removal was 0.050 inch on each side and 0.050 to 0.075 on the bottom of the groove. Cutting rate was 190 fpm (feet per minute), at a feed of 0.004 ipr.

Surface finish was very satisfactory—between 20 and 30 micro-inches in any direction. The tolerance of 0.010 inch could be held without difficulty. As for cutting time, it was slashed from forty-nine minutes, when high-speed steel tools were used, to eight minutes with carbide. Tool life was increased at least three times.

Using carbide for the interrupted cuts with the forging in the dead-soft state (Brinell 200) was then attempted. Again, conventional tool geometry produced the same difficulties. Success came with the adoption of the 30-degree negative-rake chamfer. In one roughing cut, 3/4 inch of material on a side was removed from the 11-inch diameter at a speed of 200 fpm and a feed of 0.015 ipr. The groove was plunged at 225 fpm and a feed of 0.008 ipr. For the 12 1/2-inch diameter cut, the same speed and feed were used. Then the boring tool was operated at 225 fpm and a feed of 0.020 ipr. Tool life was in excess of ten work-pieces, and then only light grinding was necessary.

Originally, the job was performed by circular milling, and removal of the 21 pounds of metal involved took eighty-five minutes. At present, turning takes but twenty-four minutes. In addition, the number of times the work has to be handled has been reduced from six to two.

The same tool geometry has been applied to jig-borer work. One job consisted of boring an arc of 270 degrees on a 4-inch diameter from an initial 3-inch diameter. The material was a mild steel forging. The tool worked well, showing good life, at a speed of 300 fpm, a feed of 0.006 ipr, and a depth of cut of 0.100 inch. A deflection of about 0.005 inch in the boring-bar caused by a 30-degree lead angle was easily removed with a clean up cut at the same setting. Intentional stalling of the machine while cutting failed to chip the carbide. Because of the high rotative speed possible, there was no chatter; and the effect of the impact shock was reduced.

The use of this tool geometry worked well in a lathe application. This consisted of turning a

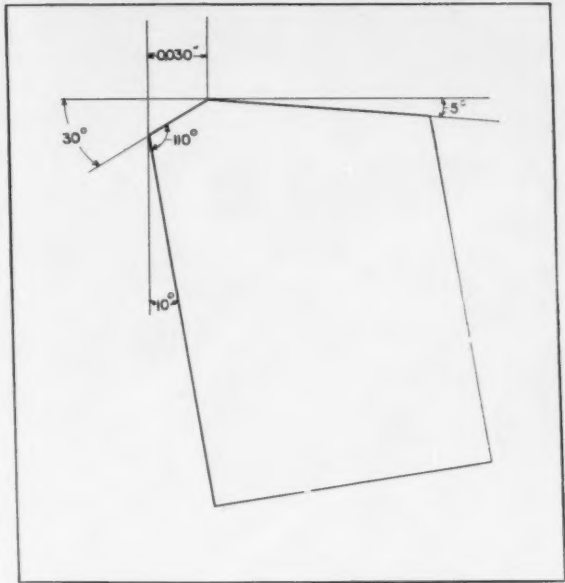


Fig. 2. The width of chamfer, here 0.030 inch, is two to three times the feed rate, and approximately one-third the distance the chip rubs on the tool face.

6-inch square forging to a 4-inch diameter cylinder.

All applications have been performed without coolant to avoid the harmful effect on the carbide of intermittent heating and cooling. The following conclusions can be drawn from the development work:

1. Tool geometry is the same for heat-treated material and dead-soft material.
2. Grade of carbide is not of prime importance, although longer tool life has been experienced with the titanium grades.
3. Cutting speeds from 100 to 630 fpm are satisfactory. Optimum tool life occurs around 200 fpm.
4. Stalling the tool in the cut does not break the carbide when this tool geometry is used.
5. Absolute rigidity of the tool or work-piece is not necessary. Deflection will not break the carbide, but there must be sufficient support present to permit a cutting action.

\* \* \*

### Surface Preparation for Welding Titanium

The surface of titanium should be clean prior to welding. Grease, oil, dirt, and scale should be removed by pickling, chemical-solvent degreasing, grit-blasting, grinding, or wire-brushing. In some instances, a combination of two or more of these treatments may be employed.

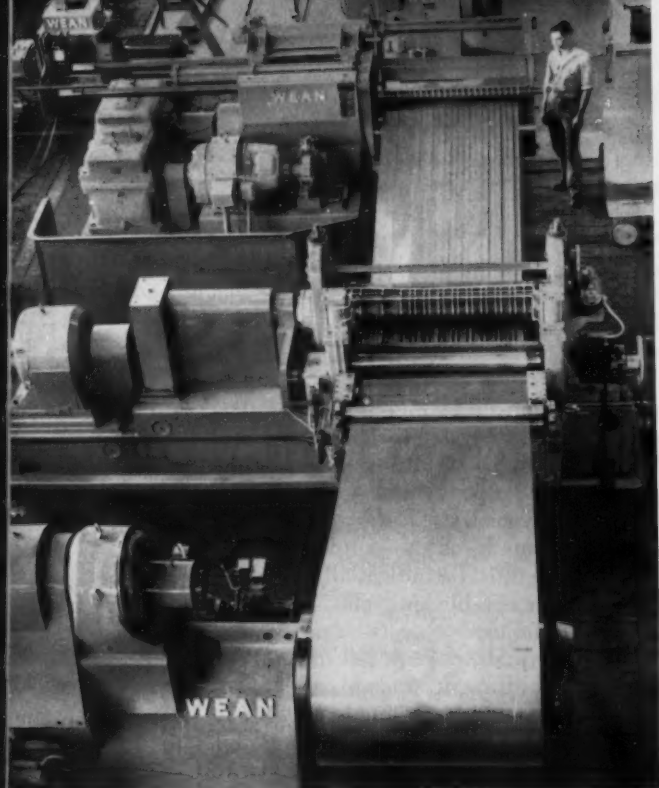


Camera highlights of some interesting operations performed in various metalworking plants throughout the nation

**SAFE STRETCH AHEAD**—(Above) In the material preparation department of North American Aviation, Los Angeles, Calif., a gripper is adjusted on special machine which gives smooth, round edges to titanium strip before being stretch-formed. Work is mechanically pulled past a series of graduated cutting tools, replacing a tedious hand-filing operation. Tendency of titanium to crack when stretch-formed has been virtually eliminated.

**LIFE IN A VACUUM**—(Right) At Hoskins Mfg. Co., Detroit, Mich., a research technician uses an optical pyrometer to check resistance wire in a vacuum. Specimens are subjected to vacuums as low as 0.5 micron throughout a resistance-heating test range from 1600 to 2600 degrees F. Technique is an important factor in company's development of wire elements for vacuum heat-treating equipment.



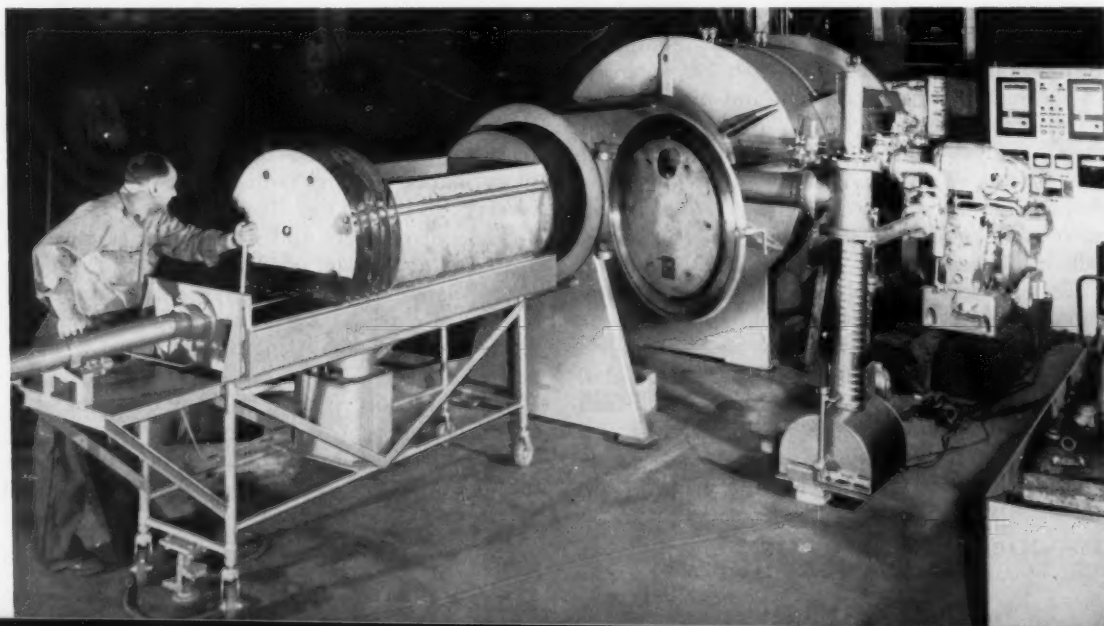


**FURNITURE FACTORY**—Capable of handling 48-inch wide steel coils weighing up to 30,000 pounds, this slitter is the first unit in a high-speed line being installed at the Hallowell Division of Standard Pressed Steel Co., Jenkintown, Pa. The line, which includes a 200-ton flying press—largest outside the automotive industry—will produce steel shop and school furniture.



**NOTEWORTHY CASE**—Important part of Pratt & Whitney jet engine is 42-inch titanium turbine case. At P & W's North Haven, Conn., plant, case is machined on a vertical turret lathe tooled with throw-away carbide inserts. Operations consist of contour-turning outside (under control of tracer attachment), facing flange, and boring and undercutting inside.

**HOT BOAT TRIP**—This Stokes horizontal retort vacuum furnace with a movable work-holding boat is used at the Martin Co., Baltimore, Md., for experimental and limited-scale production vacuum brazing of aircraft components. Boat is driven into two-zone chamber by a hydraulic ram. After processing, boat enters water-jacketed cooling zone, also under vacuum.





## Four Ways to Set Up a

# JOB EVALUATION PROGRAM

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**T**HE problem of promoting the will to work, meeting wage demands, and determining what constitutes a fair and equitable pay rate for a given job continues to perplex employers engaged in the manufacture of metal products. In any field, but especially in this industry, sound management-employee relations are considered essential to economical and efficient operations. It is possible to get a better day's work from plant supervisors and employees alike when mutually satisfactory relationships exist.

Dissatisfaction over pay rates does much to impair employee efficiency, encourage absenteeism, lower morale, and increase personnel turnover. Employers should ask themselves these questions: How does our plant management allot job rates? How do we solve wage demands? Are there any inequities in pay among employees working on the same job? How do our rates compare with other organizations in the industry?

To obtain true and objective answers to these questions there is no substitute for setting up a sound and practical job evaluation plan in your plant based on a thorough analysis of every job.

Job evaluation provides a workable tool for appraising employee performance. A systematic job evaluation plan provides employers with information necessary to gain the highest performance from each employee. Such a plan eliminates the hazards of arbitrary personal opinions and habit in determining wage rates by defining the duties and responsibilities of each job regardless of the individual who does it, and by setting up basic and consistent policies for compensation.

Job analysis tells who does what. It is the determination of the tasks, skills, knowledge, and responsibilities required of the employee for the successful performance of his job—the factors which differentiate the job from all others.

To be useful for job evaluation, an analysis should yield a very detailed and specific breakdown of all the factors involved. Such an analysis should provide an organized picture of the abilities which appear to be significant in job competence. Collection of the necessary data in a systematic, orderly way not only reduces the required effort but is also helpful in insuring ade-

quate coverage and weighing of all aspects of the job. Actually, there are three parts to the analysis of any plant job: the job must be completely and accurately identified; the task must be completely and accurately described; and the requirements made of the employee for successful performance must be indicated. Analysis provides the basis for establishing efficient management.

In addition, analysis can be used to determine the specific qualities required of employees to fill jobs for recruitment and placement purposes. Employees cannot be trained adequately unless the nature, duties, responsibilities, and other significant factors of their jobs are known.

The first step in analysis is a determination of the precise limits of the jobs as they exist, each analysis schedule describing one job as currently found in the particular plant being studied.

Contrary to popular belief, employers need not necessarily engage outside counsel to install such a system. All that is really essential is reasonable intelligence, objectivity, and a willingness to do the work. In fact, a personnel executive can collect complete, accurate, and intelligible descriptions from employees. Each individual employee in the plant can do his part by filling out a questionnaire for this purpose. Such participation will help sell job evaluation to employees.

In making a job analysis, the technician should interview inferior, as well as superior, employees. Both can help to provide a complete picture of typical duties and the kinds of information needed to perform the duties adequately. In fact, critical areas of knowledge may also be identified by observing the characteristic differences in job performance among both the more competent workers and those less efficient.

Some plants may find it desirable to maintain a dual filing system, one set of cards for regular use in assembling job analysis information and one set of cards as a permanent file to facilitate ready location of any particular item, whether active or inactive, on which data is needed.

The term "job" is used in many different ways and has different meanings according to the plant management using the term. To some it means a specific task; to others it means a group

of tasks—a position; to still others, it means a group of similar positions—a job.

A task is created whenever human effort must be exerted for a specific purpose. When enough tasks are accumulated to justify an employee, a position has been created.

A job, however, may be defined as a group of positions which are identical with respect to their major or significant tasks. So, a job may be considered as a group of positions which are sufficiently alike to justify their being covered by a single analysis.

It is usually desirable for a job analysis to cover the following information:

**Job Title.** The name by which the job is commonly called in the plant.

**Alternate Title.** Any titles other than the one commonly used.

**Number Employed.** The number of employees on the job at time of the analysis.

**Date.** Date on which the analysis was made.

**Work Performed.** A thorough and complete description of the duties—a correct portrayal of the identity, purpose, content, and requirements of the job.

**Experience.** Any experience that a worker must have had before he can satisfactorily perform the job. A worker may be required to possess specific training to compensate for lack of experience.

**Training Data.** Complete information regarding the training that is either required or helpful for a job.

**Apprenticeship.** Certain jobs require a more or less well-defined combination of experience and training.

**Relation to Other Jobs.** The relationship of the job under study to other jobs in the plant.

**Performance Requirements.** Responsibility, job knowledge, mental application, dexterity, and accuracy should be considered.

**General Comments.** All other factors pertinent to the job.

Once this information has been assembled, the next step is to choose one of the following four basic job evaluation systems now in general use.

Job evaluation is not new. The first scientific study for jobs and wage relationships was advanced in this country in 1881 by Frederick W. Taylor, who made time studies and analyzed jobs into units and duties. The analysis consisted largely of a sequential listing of the steps needed for production and the time necessary for each step. Out of this approach arose the many incentive wage compensation plans which we find in evidence today.

Employers engaged in the manufacture of metal products generally favor the use and installation of job evaluation because they are assured of a relatively stable unit personnel cost and incentives toward greater employee efficiency. It is unfair to pay the same wages to a slow worker as to a more efficient one. Consequently, a system which rewards the individual plant employee according to his skill and industry as determined by a scientific study is both more equitable and desirable.

In determining how much an employee should be paid, plant management should take into consideration these factors: the employee's responsibilities and the qualifications necessary to perform his work-assignment; his performance; and the job value from an analysis viewpoint. Job evaluation is a management technique to determine these things.

1. **The Ranking System:** This is sometimes referred to as the card-sorting system because the plant jobs are arranged from high to low, as in a deck of cards. All the plant jobs are then ranked in order of importance, in relation to other jobs, without reference to money and without reference to the individual holding down the job. The best method is to list the plant jobs in each department on a separate sheet, horizontally, and have the supervisor or foreman arrange them vertically in order of importance. The individual department head lists are then combined into one organization chart. With this system, it is essential to check to avoid disagreement.

2. **Job Classification System:** Under this system, a number of categories or grades are established in advance, and the plant jobs are then assigned to these classifications. Such a method presupposes that every job in the plant contains definite elements or phases that can be classified into grades. The grades are then established on the basis of difficulty and responsibility as represented by the number and kinds of company rules regulating the work being done, and by whether or not, and how often, the work is subject to check. The success of such a job-measuring stick depends on a thorough knowledge of all the plant jobs, so that every work element can be taken into consideration, and the duties and responsibilities of every plant employee are clearly distinguished.

3. **The Point System:** This method is the most widely used today. Moreover, it is rapidly gaining still greater acceptance. Briefly, it works something like this: A number of predetermined factors—such as age, education, years of training, experience needed, physical effort involved—are found to be common to all jobs. A schedule of points is then set up for the various gradations

of each factor. Each level should be strictly defined, so that consistent interpretation may be made. The levels or grades in each factor should be expressed or defined in writing, and it is also desirable to have each definition accompanied by examples of standard or well-defined plant jobs that are based on consideration of the following—the abilities which a plant worker brings to the job; the extent to which he is called upon to use these abilities; the responsibilities which the employer demands on the job; and the conditions under which the job must be performed. When the individual plant jobs have been evaluated, the sum of the job factors should be well under the maximum total points of the system.

4. Factor Comparison System: There are several differences between this method and the point system. One is that the graded factors are assumed to be fundamental to all plant jobs. Another is that plant jobs are evaluated rela-

tively, using given existing jobs as points or degrees on the evaluation scale, rather than descriptive definitions. This system also has the advantages of simplicity and of establishing a fixed relationship between job value and actual compensation since it is based on key plant jobs for which compensation is standard or, at any rate, not subject to controversy. Once the key jobs have been selected, they should be ranked from highest to lowest in order of importance. After the ranking, however, the key jobs are evaluated by study and examination of individual job descriptions. All other jobs in the plant are then related to the key jobs, and the final result is an agreed-upon, plant-wide grading system.

The important thing to remember in any job evaluation plan is that it should not become mechanical, but should be checked periodically to determine how effectively it is being administered at the time.

## Portable Gun-Drilling Attains New Versatility

A unique combination of Target gun drills and portable power tools has been developed through the combined research and engineering efforts of the National Twist Drill & Tool Co., Rochester,

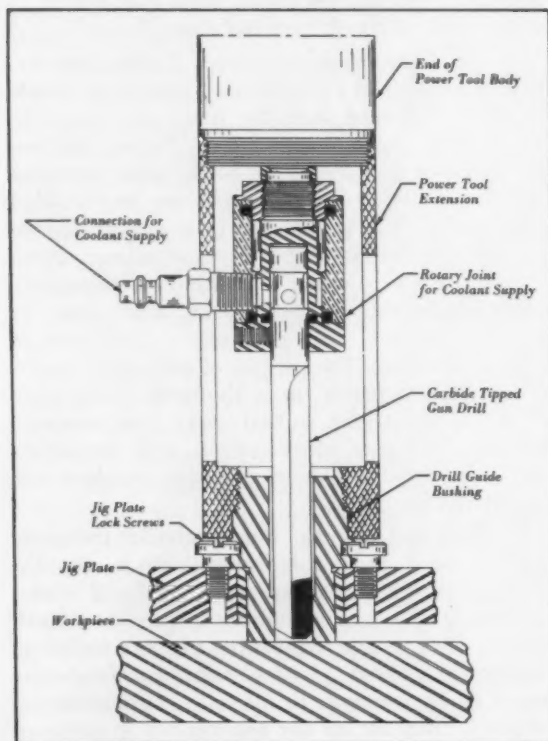
Mich., and the A. B. Quackenbush Co., Glendale, Calif. This development consists of a specially equipped, lightweight, high-torque power tool with positive mechanical feed, in which a Target gun drill is mounted and guided.

As can be seen in the illustration, the driving sleeve for the drill is enclosed within a fluid-tight sleeve that is connected to a high-pressure mist or fluid coolant supply. Openings in the driving sleeve and drill shank let the mist or coolant pass through the drill body to the point of cutting.

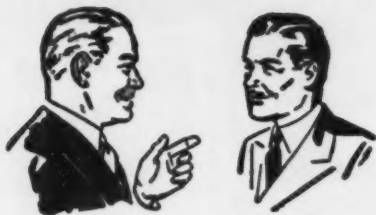
Side openings in the power tool extension allow chips to escape as they are flushed out by the coolant stream. A drill guide bushing is mounted rigidly in the front end of the extension and is placed in contact with the work. The extended part of the bushing has bayonet type locking grooves as well as a pilot for fast, accurate locking to a jig plate. This jig plate, which is the only external tooling needed, contains bushed holes to receive the drill guide bushing.

To change from one drilling position to the next it is only necessary to turn the tool a fraction of a revolution, pull it out, move it to the next location, and lock it to the jig plate again. The secure locking arrangement and the light weight of the tool eliminate the need for any other support during the drilling operation.

Lightweight power tool with positive mechanical feed for portable gun-drilling operations. Locating and locking arrangement adds to the tool's accuracy and ease of operation.







# Talking With Sales Managers

BERNARD LESTER

Management Consulting Engineer

## Improve the Industrial Exhibits

**A**NY one of us closely allied with industrial shows and exhibits may be haunted by memories such as these:

The conventional exhibit—plush drapery, framed photographs, table loaded with samples and literature. In the center one forlorn man sits reading.

The exhibit jammed with novelty seekers of all ages who block the entrance to our potential customers.

The equipment exhibit where machinery periodically starts with the boom of a jet plane breaking the sound barrier.

The exhibit you hate to approach for fear a dozen charmers will pounce on you and start their palaver.

Exhibits such as these still exist. They emphasize that show business must not be a routine budgetary affair left entirely to a specialist and the agency. It is inherently complex and worrisome. We are first pressed to enter more and more trade shows. The total number is 70 per cent greater than seven years ago. Our own officials cry for the spice of originality in every display. It is requested that each product we build be given a bigger share of exhibit space. Each show demands that we organize and train a group of scattered sales engineers into a well-formed, efficient team. We grope for a method to measure returns. And praise? It may come chiefly from suppliers and our young salesmen from Oshkosh privileged to attend.

If your show business has bogged down, or the specialist in charge has become self-satisfied, revive this decisive way to strengthen long-range sales. Don't judge a display by what I or my associates like. The exhibit is only good if it arrests attention and then shows some way to increase profits. Customer mood and taste must be the judge and jury.

To improve the industrial exhibit let's not rely on new tricks. Exhibits mostly succeed because simple and important things are done well.

1. Confine the number and extend the quality of your exhibits. Don't let a lifeless and poorly located display do a negative sales job.

To select the right shows, study the bookers and managers, consult your trade association, and examine and evaluate past attendance records.

2. Fix a key objective for each exhibit based on customer interest and need. Buying motives vary with changes in processes and available equipment. By studying objectives we compel ourselves to plan each exhibit to lead rather than trail customer thinking.

3. Select a favorable location or none at all. This requires early scheduling. Study aisles, traffic, and possible neighbors. Many excellent exhibits are tucked in some dark corner; others are like the folks next door whose radio blasts all night. Don't be miserly with space. Its cost is a small part of the total. Lack of perspective ruins a machinery display.

4. A good exhibit is like a good play well acted. It has a distinctive theme supported by skilled characters. It inspires, entertains, and informs. Above all, it makes the onlooker ask questions of himself. Stunts and twists attract and amuse—but beware! In exploiting equipment dramatize operating results.

5. The sales engineer is the main support to the display. To meet technical prospects, assign your best sales engineers with appointments planned in advance. While indoctrinating exhibit personnel, stress appropriate sales techniques, important jobs pending, and customer representatives likely to attend.

6. Keep accurate prospect records; and, above all, enliven the follow up. Name, place, and interest—very real at the moment—easily get lost in the shuffle. Make sure each sales engineer upon his return organizes each follow-up before he gets absorbed in regular work.

7. Appraise your display and also the exhibition promptly after the show. Call for a brief but itemized report. Its chief purpose is to point up ways to improve.

Don't underrate the value of trade shows. Results come slowly, especially when capital equipment is involved. Since operating executives insist that their key men attend shows to learn, industrial exhibits are a potential market place.





## Cutter Design Speeded with Computer

**A**N electronic brain does in two to ten minutes the work of solving problems which formerly took engineers two to four hours at the Fellows Gear Shaper Co., Springfield, Vt. The machine, a Bendix G-15 computer, is currently applied to problems involved in the design and detail of tools used on the company's line of gear shapers and gear shavers.

The shaper cutter resembles a conventional gear, but has side clearance, top rake, and face rake which must be accounted for in designing the tool. In the past, the design was established by layout, and the correction factors obtained by computation work done on desk calculators and slide-rules.

Now, when a customer's gear requirements are received, the gear cutter program is read into the computer. Gear and cutter specifications are then typed in. This requires from two to three minutes. Computing and typing out the answers takes from two to ten minutes, depending on the problem. In this brief operation, all the calculations needed to manufacture the gear cutter and to maintain it are made.

Sharpening tables for shaving tools previously were obtained geometrically from curves to avoid lengthy and repetitive calculations. With the computer, a complete set of twenty-three equations needed to determine the pressure angle for sharpening are solved for each increment. As many as twenty-nine sets of solutions are derived for each tool.

Basic input for the computer is a punched paper tape. That is, information, such as the formulas involved and the sequence of operations, is coded into machine language. The tape is about 5/8 inch wide. It is wound on spools and held in magazines. Since the tape is prepared by the computer itself, no other equipment is necessary. Once the tape is positioned in the machine, the punched holes are read by photo-electric cells and transmitted to a rotating magnetic drum. The information is then recorded as a series of magnetized dots on the drum which serves as the basic memory storage for the computer.

A typewriter is used to introduce the data for each particular case into the magnetic drum. This data consists of the number of teeth in the cutter, the diametral pitch, and other pertinent information. After the data has been typed in, a signal is given, and the computer immediately goes to work. Answers are then typed out. Fellows has devised manufacturing forms which label the input data and the values that are computed as output data for the various problems. These forms are used in the computer typewriter and, when the problem has been run, all the calculated information required by engineering and manufacturing is supplied. The computer types out the answers on the form, where they are labeled for easy identification.

A great amount of information which the engineer ordinarily would not bother to calculate, and which in many cases results in tools of a

better design, is obtained from the computer. For example, if an engineer knows that nine times out of ten an angle is the same number of degrees, he will leave that calculation out. On the other hand, in computer programs that may run for hundreds of cutters, the angle is calculated repeatedly and thus is always theoretically correct. Where approximations were formerly made with curves, the computer goes through a complete geometric or algebraic procedure and types out precise answers.

The computer has about 450 electron tubes and some 2000 diodes arranged in convenient packages with printed circuits. Maintenance is simplified by using packages, since trouble can be isolated to a defective package which is then replaced. Another application at Fellows is a cutter indexing routine. The indexing is set up so as to prevent the duplication of engineering design work. Information on completed cutters is stored on magnetic tape, and the search time is five minutes for 1000 cutters.

## Pneumatic Cotter-Pin Spreader Facilitates Assembly of Washing Machines

By mechanizing the spreading of a cotter-pin, the assembly of domestic washing machines is being expedited at the Clyde (Ohio) Division of the Whirlpool-Seeger Corporation. Specifically, gears are attached to one end of agitator shafts by means of the air-operated device here shown.

After the hollow gear and a washer are slipped over the long agitator shaft, the assembly is placed in the fixture. The cotter-pin is then placed in a hole in the shaft approximately 1 inch above the hollow gear. A recess in the base of the fixture positions the shaft for the operation.

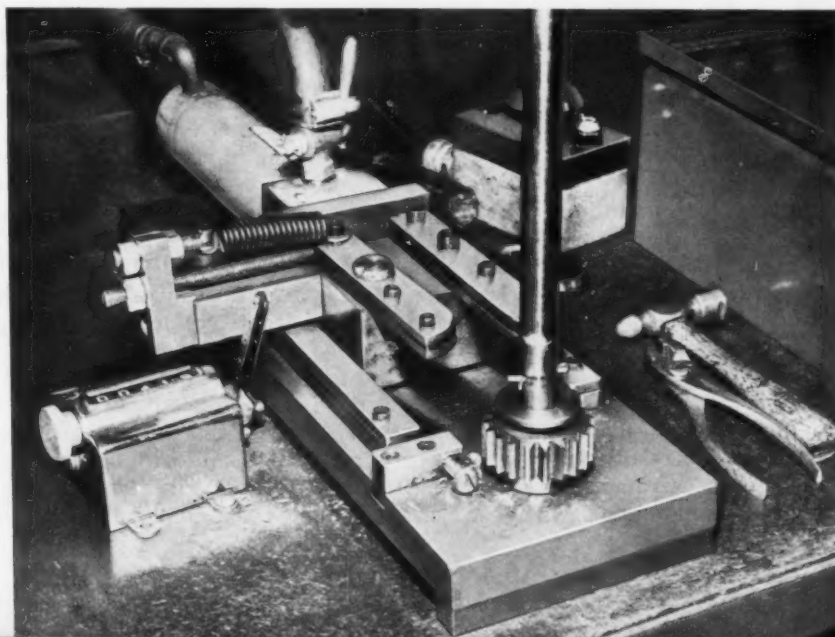
Located at the back of the shaft is an air-operated slide that advances and quickly retracts when the operator presses a palm button. On the slide are two slotted jaws; the one at the right is bolted fast to the slide, but the one on the left can pivot clockwise. A tension spring

and an adjustable stop hold the pivoting jaw in a pre-set position.

When the slide advances, the slot in the larger jaw, on the right, engages the head of the cotter-pin and holds it in a horizontal position. Then, the other jaw travels over the point of the cotter-pin until the longer prong enters a recess in the bottom of the slot. The long prong is bent forward as this jaw continues its outward stroke, and thus spreads the cotter-pin as desired. Both jaws are returned when the hand is removed from the palm button. When the jaws clear the assembly, it is removed manually.

Use of the fixture speeds assembly of the parts as no hand tools are required. Since the operator holds the shaft near the top with one hand and presses the control button with the other, both hands are in safe position.

Air-operated device that spreads cotter-pins. Assembly is part of a home-laundry washing machine.





## Visible, Versatile Files Improve Tool-Crib Control

GEORGE A. MERCER, III, Vice-President  
Steel Products Co., Savannah, Ga.

**A** SYSTEM that utilizes visibly indexed files is helping Steel Products Co. to save thousands of dollars a year by controlling the tools and parts employed in assembly operations. This company manufactures a variety of commercial trailers in shops which have an aggregate of 175,000 square feet of manufacturing space and 20,000 square feet devoted to a warehouse area.

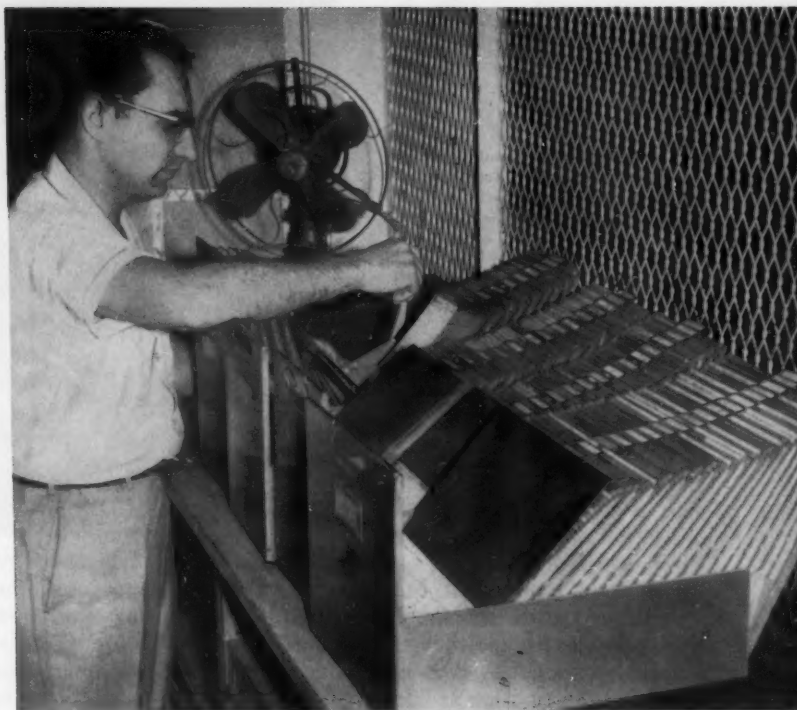
In the past, keeping track of the numerous small hand tools and the various parts which are necessary to make these tools effective was an almost impossible job. If 100 drills were used in a day, there was no way of knowing whether this quantity was due to breakage, loss, pilferage, or simply normal consumption. By the same token, it was difficult to control larger equipment, such as hand power tools, which were in use all over the plant. Since many workers needed the tools daily on a more or less permanent basis, it was impractical to check them in every night and out again the next morning. Yet,

this equipment represented capital assets which could not be accounted for unless a major inventory was taken. This setup invited the misuse of expensive equipment.

A new tool-crib control system has completely eliminated these problems; and, in addition, has permitted the charting of tool activity for a more efficient use of the company's equipment. Tool control is now built around Remington Rand Kolect-A-Matic files which occupy less than 3 feet of shelf space within the crib area and a Kardex inventory file. In the four Kolect-A-Matic trays shown in the heading illustration, there are actually two separate files—one having a card for each employee involved in tool handling and the other, a record of all tools and parts that are circulated in and out of the tool crib.

In the employee file, each worker is assigned a unit card with his name and clock number on the visible edge. These cards are filed in the order of the employee's clock number. Also along the

**Fig. 1. To post a temporary tool withdrawal, the clerk simply drops a copy of the charge-out slip into the proper file pocket. Visible signals on the edge of each pocket indicate the number of permanent tools charged to any worker.**



visible edge of each card pocket there is a movable Graph-A-Matic signal. As permanent tools are taken out or returned, the information is posted on the body of the employee's card, and the signal is adjusted to indicate the number of these tools still charged to a particular worker. Consequently, a careful check is kept on the number of permanent tools borrowed by any worker.

In the tool file, charge-in and charge-out information is posted on the unit cards which are placed in numerical order by classification and tool number. In other words, this is a cross-check system showing the location of a tool by looking either in the tool file or the employee file. With this arrangement, all permanent tools can easily be accounted for at any given time. The same is true of equipment in temporary use except that posting is adjusted to the frequency of tool traffic.

When a worker needs a power hammer on a temporary basis, for example, he fills a charge-out form in triplicate in his own department. The form lists the employee's clock number and department, pertinent information about the tool, and the date. The foreman must approve the charge-out and make a copy for his personal records.

If the foreman approves, the mechanic takes the slips to the tool crib, where he hands over two copies in exchange for the equipment, and

retains the third for his own record. In the tool crib, one copy is posted against the employee simply by dropping it into the proper file pocket; the other copy is dropped into the pocket of the tool unit card, Fig. 1. Therefore, in a matter of seconds and without any transcribing, the charge-out is posted against both the employee and tool unit cards.

When the worker returns the tool, both copies are pulled from the file and he is given the second copy as a receipt. The third copy is then entered on the body of the Kollect-A-Matic card for the tool. This card becomes the activity chart of the tool. It tells how often the tool is used, the length of its life, and other pertinent information.

As far as equipment borrowing is concerned, this is the complete control cycle. Every piece, from major tools right on down to a single drill, can be accounted for at any given moment.

At the same time, the system serves another function—the correction of improper applications of the tool. If a worker should borrow a 1/4-inch drill and it is broken in use, he must fill a damaged tool report and return the broken drill to the tool crib. This report, filled in triplicate, contains an administration copy, a toolroom copy, and an employee copy. The information on the toolroom copy is posted on the activity chart of the tool.

On examining this chart, any trends toward



**Fig. 2.** The visible signal on each inventory control card tells whether the material is in normal supply. Other information on the visible edge gives the exact section and bin location of the item.



an unusual amount of breakage on particular operations are discovered. Excessive tool breakage indicates that either the tool is not being handled properly or it is not suited to the job. With this information at hand, the engineers can recommend changes aimed at increased plant efficiency and safety. Recently the control system has been expanded to cover expendable items as well as tools.

An inventory control file in Kardex cabinets is also maintained within the tool-crib area. The items are filed by a numerical code. The visible edge of the card shows the number and name of the part and its exact location in the crib by bin and section. In Fig. 2, a tool-crib attendant is shown checking an item in the inventory file. The body of the Kardex unit contains a minimum and maximum inventory figure which has been

predetermined so that the material will always be in adequate supply.

In this case, a Graph-A-Matic signal is set along the visible edge to indicate that the material is in normal supply. Large items are figured in single units; but small items, such as pin clutches, are stocked in units of one hundred. When an item is used or expended, this information is posted on the inventory card, Fig. 3. If the withdrawal causes the item to fall below the minimum supply, the traveling requisition is pulled from the file pocket and sent to the purchasing agent. The fact that the traveling requisition is actually a part of the file for the item saves the writing of a triplicate form.

EDITOR'S NOTE: A detailed description of the Remington Rand tool control systems appears in the book "Better Tool Cribbs" by William Raisglid, published by THE INDUSTRIAL PRESS.



**Fig. 3.** As materials are expended and the inventory falls below a predetermined minimum figure, the traveling requisition card is pulled from the inventory control file and forwarded to the purchasing agent for re-order.

Tools and fixtures of unusual design and time- and labor-saving methods that have been found useful by men engaged in tool design and shop work

## Trimming Die with Unique Features

BUCKLEY SULLIVAN, Cleveland, Ohio

A novel die was designed to perform a trimming operation used in producing the shallow drawn cup shown at the left in Fig. 1. The part is made by blanking, drawing, piercing, and trimming in three operations.

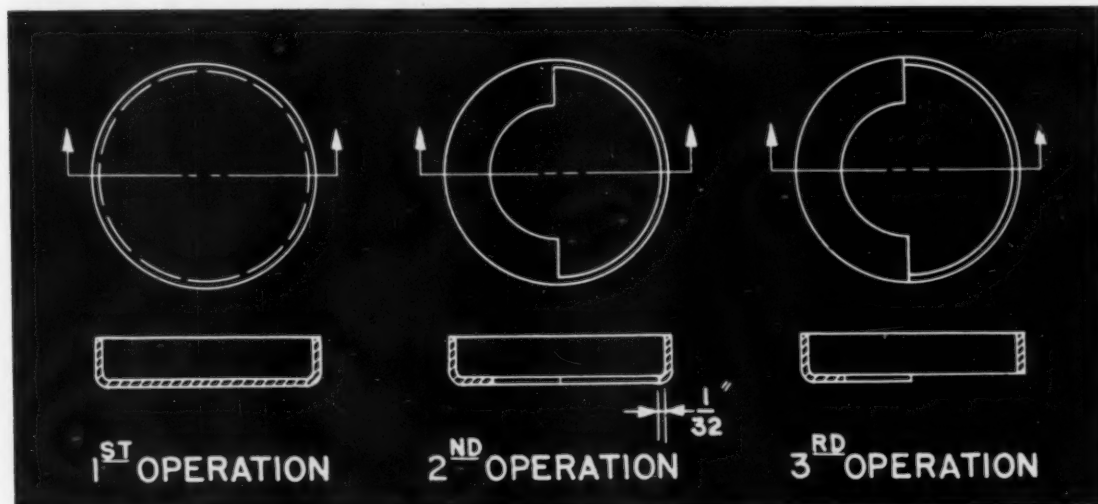
A compound die is first used to blank the part from 20 gage steel strip and then draw it into a cup that is 1/2-inch deep and 2 inches in diameter on the inside. As the inner radius at the corner is only 1/16 inch, deep-drawing quality steel is used in order to eliminate tearing and popping.

The second operation, performed in a conventional die, pierces out most of the bottom of the cup (Fig. 1) but leaves a semicircular segment. Also remaining after this operation is a 1/32-inch lip extending halfway around the bottom edge of the cup wall. It is the trimming of this edge that led to the designing and building of an unusual die.

The troublesome lip is to be trimmed so that the lower edge at the open half of the cup is even with the inside surface of the portion of the bottom that remains. A burr-free lip without knife edges is required. Pinch trimming is therefore not permissible. Cam-operated trimming dies were also ruled out since two operations or complicated cycling of two or three cams in one die would be required.

The die developed for this trimming operation is shown in its final evolution in Fig. 2. Vertical clamping member A is made of cold-rolled steel and is mounted on the punch-holder. A hardened steel insert on the lower end provides a clamping and cam surface that can be replaced when worn. The shear blade B is made of hardened and ground oil-hardening tool steel. Flat-ground stock was used so that easy production of replacement blades is possible. Member A is offset from the shearing blade a distance equal to one

Fig. 1. Part is first blanked and drawn into a shallow cup (left). Lip remaining after piercing (center) is removed in third operation by trimming die.



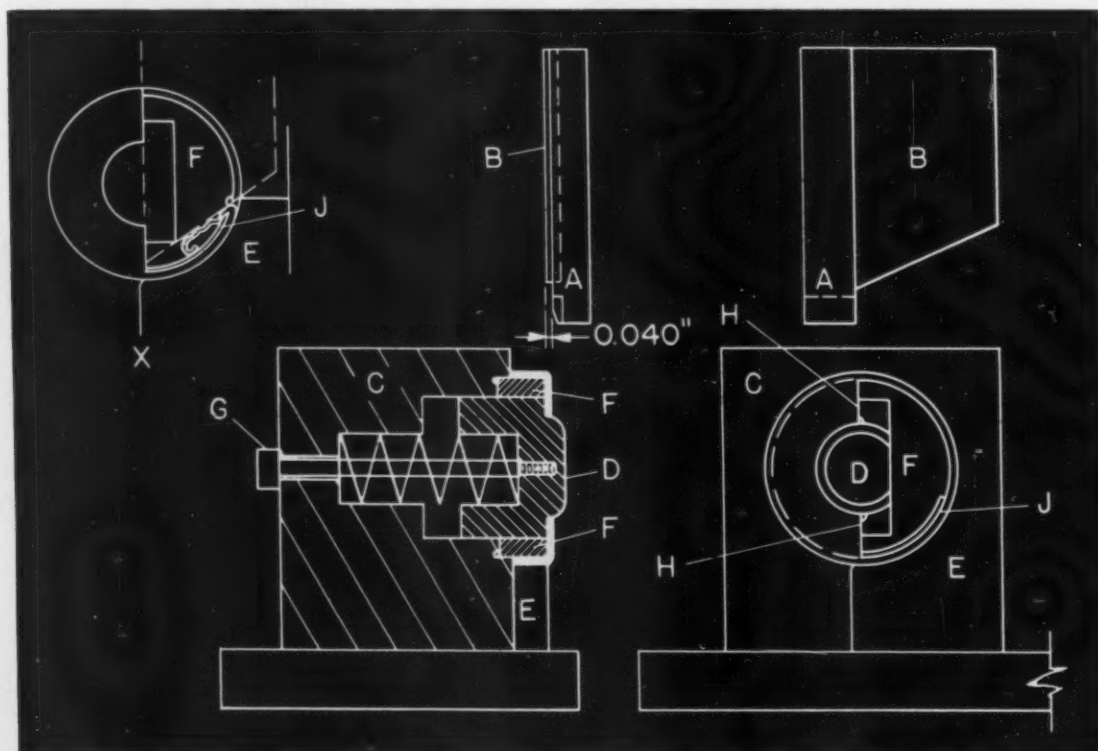
metal thickness plus clearance. In this case the offset was 0.040 inch. Both these members are secured by screws and dowels to a cold-rolled steel supporting block that is not indicated in the illustrations. As shown in Fig. 2, the lower end of member A projects below the shear blade to clamp the part before the cut begins.

The die consists of a built-up body C, a sliding pilot D, and a shearing block E. For locating purposes, the stamping fits snugly over a turned and ground projection F on one end of the body. This projection, which also acts as a shear blade for part of the cut, is made a separate part to facilitate replacement. The pilot is spring-loaded and slides within the hardened and ground body of the die. A rectangular shank prevents rotation of the pilot which is retained within the cavity by bolt G. Locating edges H on the pilot bear against the edges of the straight section of the hole pierced into the bottom of the cup and position it in the vertical direction. When the die is open these locating surfaces project beyond the face of the body far enough to effect positive alignment of the part. The pilot is made of hardened and ground water-hardening tool steel. Although the pilot receives severe treatment during the operation of the die, it has not worn sufficiently to warrant replacement.

When the ram is tripped, the clamping member A pushes the sliding pilot completely out of the path of the shear blade by the time it has traveled about 1/4 inch into the work. During the first half of the trimming cut, the thrust of the shear blade tends to rotate the part in a clockwise direction. Turning is prevented by the now vertical edge of the bottom of the cup. This edge bears against the vertical portion of the shear blade, as seen at X in Fig. 2. Pressure on the work is quite great at this point, but buckling is prevented by the clamping member.

In trimming the lower half of the cup (as mounted), the shearing action takes place along the outer edge, and the shear block E is utilized. This is also shown at X in Fig. 2. A relief machined on the bottom of the projection F at J eliminates the necessity for a precision relationship between the part, the die body, and the edge of the lower shear block. This relief also facilitates loading and unloading of the die, prevents jams due to part tears and chips, and largely reduces wear on the die. This die has been in production for about three months and has proved quite economical to operate and maintain. Except for occasional heavy burrs forming where the cut shifts from F to E, quality of the trimmed edge has been consistently high.

Fig. 2. Unique die that is used for trimming operation on a shallow-drawn cup.



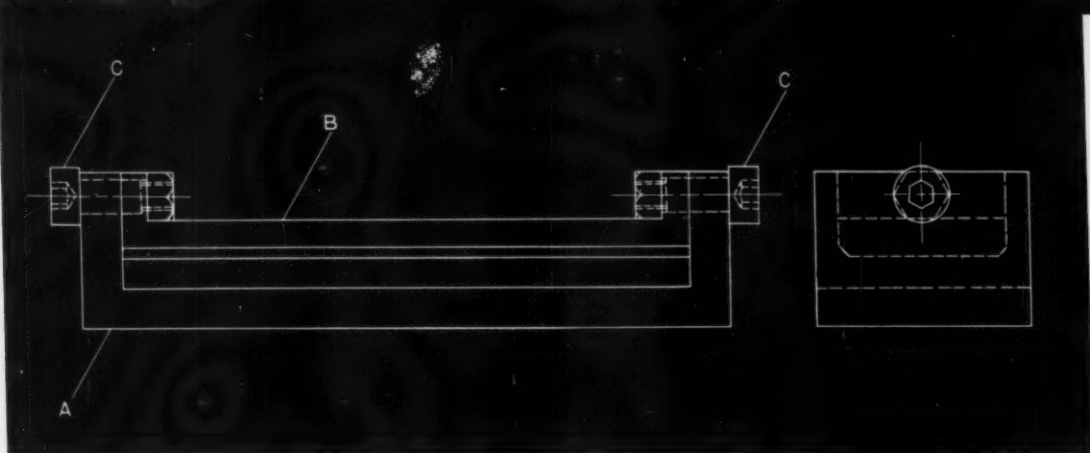


Plate (A), on which the work is supported, can be adjusted to any angle through its trunnion assembly with base (B).

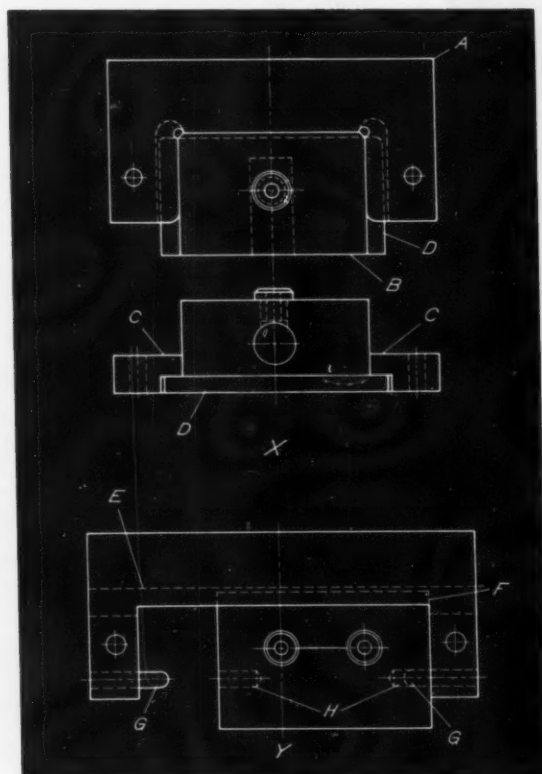
## Grinding Fixture Has Adjustable-Angle Feature

RICHARD MINSER, Cleveland, Ohio

Work can be readily ground at an angle by supporting it on an adjustable fixture like the one shown. There are two U-shaped components—base A and swinging plate B. The base forms a cradle for the plate which is drilled and tapped to receive the bolts of hold-down clamps.

Two stripper bolts C are used as trunnions

which run through holes in the end sections of the base and plate. The plate can be fixed at any desired angle by tightening the bolts with a hexagon key. To hold the nuts from turning, the center line of the holes containing the stripper bolts should be fairly close to the top of the plate. The nuts then will not work loose.



## Drill Jig Locator Plates with Added Safety Feature

W. M. HALLIDAY, Southport, England

Locator plates used in conjunction with drill jigs are helpful in aligning the jigs and thus preventing the drill from deflecting. The accompanying illustration shows two of these plates, with added safety provisions for holding the jigs down when the drills are being retracted.

In view X, plate A accommodates a one-hole drill jig B. The jig fits a rectangular opening in the plate. Integral lips C on the sides of the opening retain the flanged base D of the jig.

For a two-hole jig, view Y, a lip E is cut along the back of the opening, and the base of the jig has a flange F to fit. Dowel-pins G are pressed into the sides of the plate and alternately engage holes H. These holes are about 1/32 inch larger than the pins, and the distance between the pins is greater than the length of the jig, so that the latter can be centered and withdrawn.

The lips of the locator plates engage the flanges of the drill jigs, eliminating the danger of the jigs rising when drills are retracted.



# SHOP KINKS

## General-Purpose Fixture for Round Work

J. RANDOLPH LUCAS, Richmond, Va.

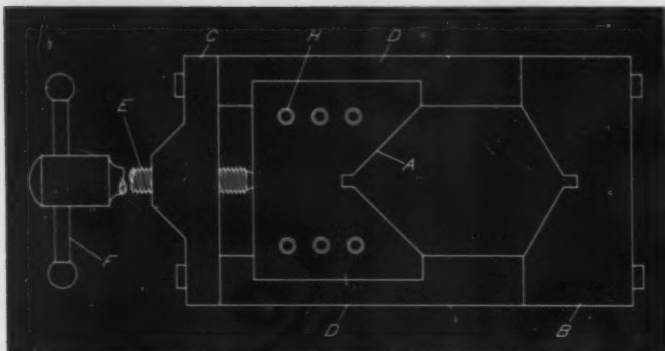


Fig. 1. General-purpose fixture designed for holding round stock.

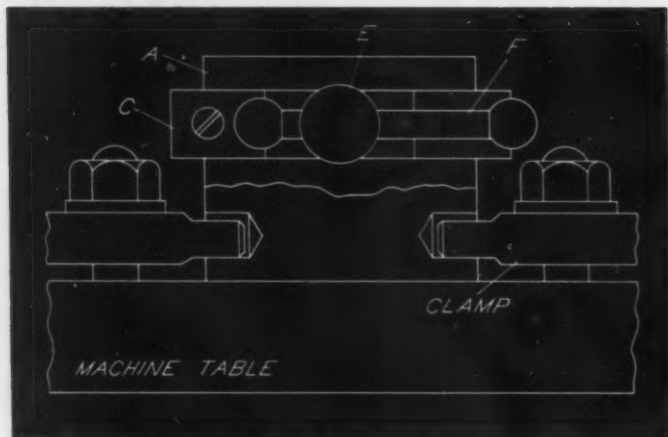
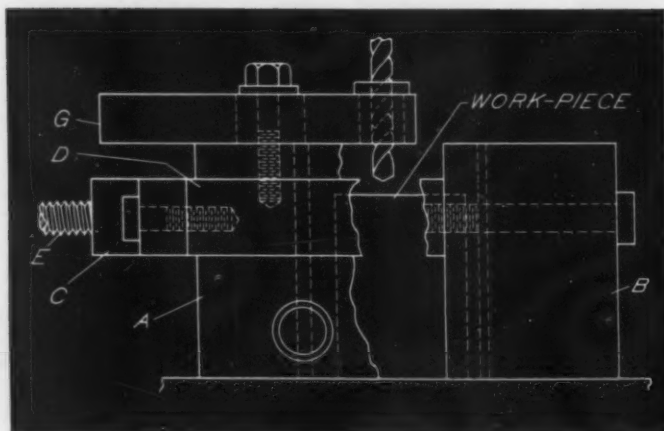


Fig. 2. Fixture is strapped to milling machine table by clamps.



Small shops will find the fixture shown in the accompanying illustrations useful in milling, grinding, and drilling operations on round stock. This fixture permits immediate and accurate location of production pieces and is easily constructed. As seen in Fig. 1, it consists of two vee type jaws A and B, a back-plate C, and two side-pieces D. The side-pieces are fixed to both jaw B and the back-plate, and slide in two milled slots in jaw A. The back-plate is drilled and tapped for screw E. The end of this screw bears against the back of jaw A.

In operation, round stock is placed against the vee in jaw A, and a handle F is rotated to lock jaw B against the work. For milling operations the fixture may be secured to the machine table by clamps inserted into holes provided in the base of jaw A as illustrated in Fig. 2.

An additional feature of this device is its ability to locate holes in the top face of round work-pieces. This application, shown in Fig. 3, is accomplished by attaching a plate G to jaw A by means of screws. This plate may be secured to any two of the three sets of tapped holes in the jaw, depending on the diameter of the work. A drill bushing is then located in plate G. Additional lateral movement is easily provided by slotting the clearance holes in the plate, thus making it possible to locate the bushing precisely over some reference point on the work.

Fig. 3. Plate attached to fixture permits location of holes in round work-pieces.

## Two Small Index-Plates Replace Conventional Large Plate

H. J. GERBER, Stillwater, Okla.

Often a pin-to-hole type index-plate is excessively large in diameter when used to provide a great number of divisions. Two smaller index-plates, each having half of the total number of holes in the big index-plate, can be substituted for the large plate. These plates are then accurately aligned, with the holes in one disc staggered with respect to the holes in the other disc. The illustration shows such a double-plate arrangement. The discs are fastened together with cap-screws and dowel-pins. In place of the original single index-pin two accurately aligned index-pins are used to engage the holes in the plates.

The usual spring type detent for the pins is not needed with this arrangement, since one pin will ride on the peripheral surface of its plate while the other pin is engaged. The additional space between the holes permits a larger pin diameter to be used; thus providing increased strength for the indexing mechanism.

## Socket Permits Adjusting Center Distance

A. S. ARNOTT, Toronto, Canada

The frame of a light-duty mechanism can be manufactured more rapidly if a bearing hole for a gear or sprocket does not have to be located precisely. By using the cast socket illustrated, the frame can be bored oversize at the approximate location, and the gear center can then be adjusted accurately at assembly.

Machine frame A is bored a free fit with rough

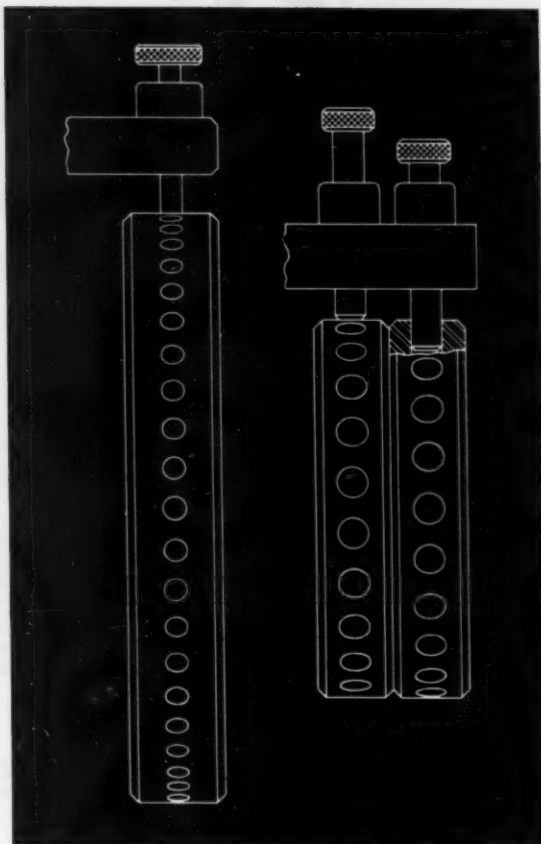
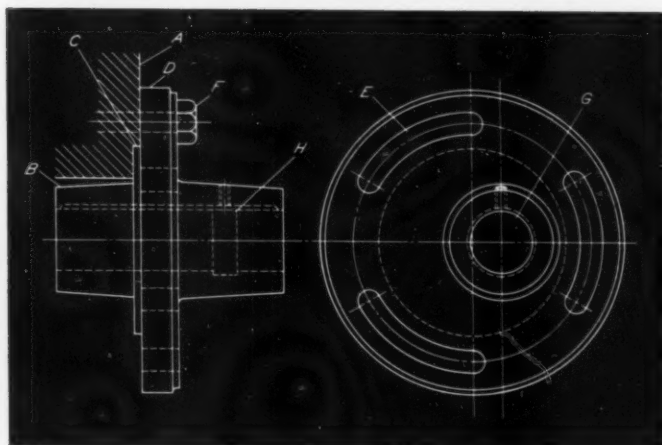


Diagram showing how two small index-plates can be substituted for a cumbersome large plate.

diameter B and counterbored a close fit with machined diameter C. Flange D has three curved slots E which accommodate cap-screws F engaging tapped holes in the frame. Bored diameter G, which receives the bearing for the gear shaft, is eccentric to the socket body.

By rotating the socket slightly the gear center is raised or lowered, thus altering its distance from a mating gear. The socket can be designed for either a sleeve bearing or an anti-friction bearing. If it is designed for the former, oilway H is also included in the socket wall.

The socket is rotated in the machine frame to adjust the center distance between a gear held in the socket and a mating gear.



# MACHINERY'S PROBLEM CLINIC

Mathematical problems in shop work and tool design submitted by readers of MACHINERY

Edited by HENRY H. RYFFEL

## Specify Reference Angles to Help the Toolmaker

HANS SCHUBERT

Too often tool designers will omit angles and dimensions which, although technically unnecessary, would make the toolmaker's job easier.

A case in point is shown at (a) in the accompanying illustration, where angles A, B, and C were omit-

ted although by specifying them the toolmaker could more easily mill the straight surfaces to blend with the radii shown.

**Solution:**

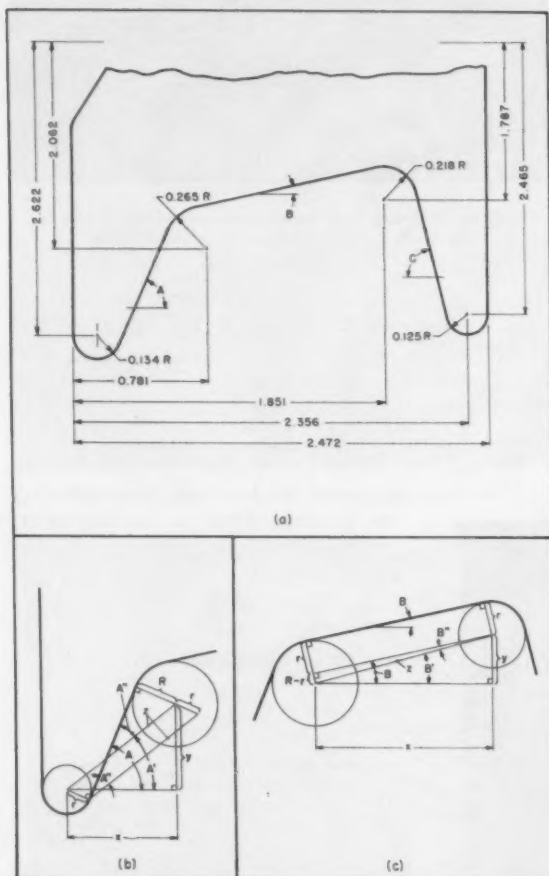
A layout for calculating angle A is shown at (b). Angle A is the sum of angles A' and A''. Dimensions R, r, x, and y have been obtained from diagram (a). Thus,  $R = 0.265$ ,  $r = 0.134$ ,  $x = 0.781 - 0.134 = 0.647$ , and  $y = 2.622 - 2.062 = 0.560$ .

1.  $\tan A' = \frac{y}{x} = \frac{0.560}{0.647} = 0.86553$   
 $A' = 40^\circ 52' 38''$
2.  $\sin A'' = \frac{R+r}{z} = \frac{R+r}{y \csc A'}$   
 $= \frac{0.265 + 0.134}{0.560 \times 1.5280} = \frac{0.399}{0.85568}$   
 $= 0.46629$   
 $A'' = 27^\circ 47' 37''$
3.  $A = A' + A'' = 68^\circ 40' 15''$

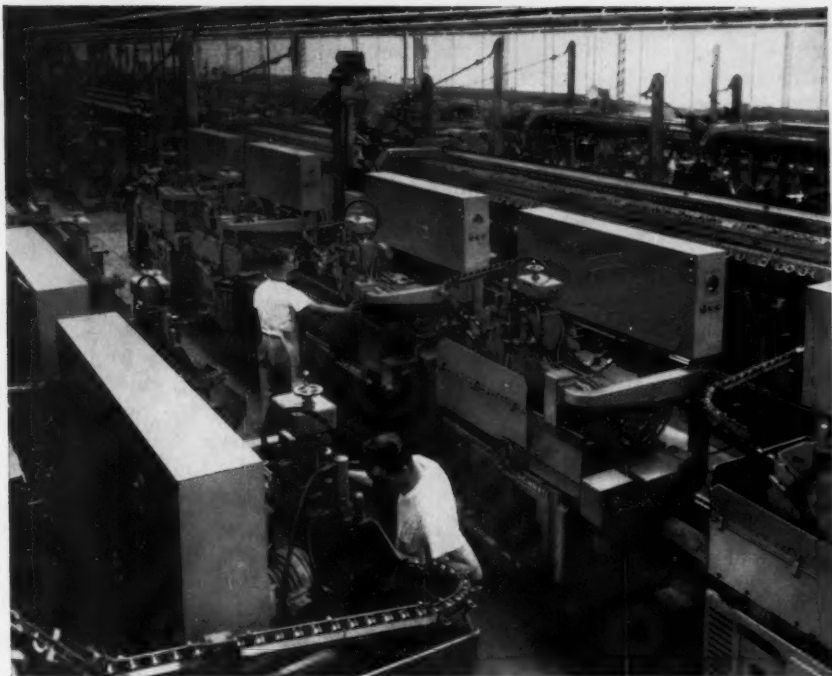
Angle B can be computed with the aid of diagram (c). As can be seen,  $B = B' - B''$  and from (a),  $R = 0.265$ ,  $r = 0.218$ ,  $x = 1.851 - 0.781 = 1.070$ , and  $y = 2.062 - 1.787 = 0.275$ .

4.  $\tan B' = \frac{y}{x} = \frac{0.275}{1.070} = 0.25701$   
 $B' = 14^\circ 24' 48''$
5.  $\sin B'' = \frac{R-r}{z} = \frac{R-r}{y \csc B'}$   
 $= \frac{0.265 - 0.218}{0.275 \times 4.0174} = \frac{0.047}{1.10478}$   
 $= 0.04254$   
 $B'' = 2^\circ 26' 17''$
6.  $B = B' - B'' = 11^\circ 58' 31''$

Angle C is computed using a diagram similar to that seen in (b).



(a) Punch on which the straight sides must be blended smoothly with the radii shown; (b) diagram used in calculating angle (A); (c) diagram for calculating angle (B).



## 30-Million Bearings a Year

**From the loading of hot-rolled steel tubes on the screw machine stock racks until the finished bearing is wrapped and boxed, all operations, including final gaging, are handled automatically. Parts are moved from one operation to the next by means of conveyors, chutes, and magnetic elevators.**

**P**RODUCING tapered roller bearings in a steady, uninterrupted stream—with manual handling virtually eliminated—had been envisioned at the close of World War II. This concept of manufacture is now represented by the Bucyrus, Ohio, plant of the Timken Roller Bearing Co.

Many of the machine tools in the five cup and five cone lines have been specially designed and built to fit into this straight-through production system. Other machines are basically standard models that have been modified to perform special tasks and to accept the many unique feeding devices found throughout the plant. In the event of breakdown, any machine can be quickly disconnected from the line and another machine inserted in its place. Lost time is kept at an absolute minimum—in many cases no more than one hour. Cutting tools that have been pre-set for the particular operation are changed at

predetermined intervals, even though the parts have not begun to run out of tolerance.

At the head of both the cup lines and cone lines are banks of automatic bar machines. The cup line is fed by 2 1/2- and 3-inch, single-spindle, Acme-Gridley bar machines and 4 5/8-inch, single-spindle New Britain bar machines. Feeding the cone lines are 1 1/2- and 2 5/8-inch, four-spindle, Conomatic bar machines.

The specially designed stock racks that feed the bar machines hold an eight-hour supply of tubing. When a single-spindle machine is out of stock, it stops, the loading ram retracts, and the collet opens. An attendant removes the butt end of the bar and actuates an air valve. The loading cradle is opened, a new tube rolls into place, the cradle closes, and the ram pushes the tube into the spindle and against the stock stop. After automatically chucking the tube the machine resumes operation.



Because of the wide range of diameter tolerance on the SAE 4620 hot-rolled steel tubes, hand chucking of each new tube is not practical. All chucking devices used on the bar machines incorporate properly proportioned Belleville springs (dished washers that have a nearly flat load-deflection curve) so that nearly constant gripping pressure is applied to all the tubes.

Carbide tools are used throughout the plant. This presented a problem with regard to cut-off operations on the single-spindle automatic bar machines. Satisfactory performance was obtained by using two cut-off tools working simultaneously. The first, or narrow, tool produces one wide chip while the second, or wide, tool produces two narrow chips. The narrow tool leads the wide tool by 0.015 to 0.020 inch. Before breaking into the bore the narrow tool is retracted and the wide tool continues to feed in. A free chip flow out of the cut-off slot results.

After the cones are turned, bored, undercut, faced, and have the tapered bearing race turned and formed on the four-spindle machines they are dropped onto a conveyor and led to a 3 1/2-inch Conomatic chamfering machine. Here, after being automatically located on an expansion mandrel, a chamfer is cut in the front face of the bore. The cones then pass to a 60-ton Minster press where they are automatically positioned, have the company name, part number and other information deeply coined on their faces, and

are finally unloaded and led away to one of several storage bins prior to heat-treating.

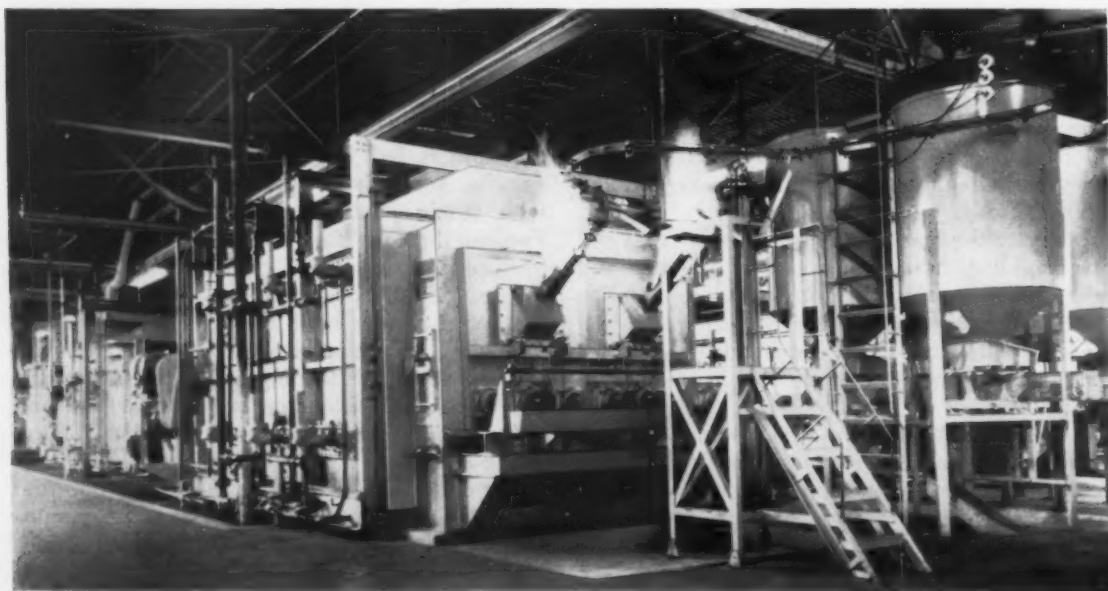
Groups of bulk storage bins are located at both ends of the furnace banks. Because it is not feasible to shut down the heat-treating equipment each week-end, the facilities are geared to handle the product volume in seven days that the rest of the line handles in five days. Each bin, therefore, can store a normal two-day supply of one particular part.

As can be seen in Fig. 1, the storage bin in use can feed both furnaces. The parts roll along a single overhead chute to a release gate at the joint of the "Y". This gate feeds the parts alternately to each of the two Surface Combustion furnaces. Alternate feed is necessary to maintain the proper feed rate through the furnaces.

The first operation is carburizing in a spiral retort furnace using endothermic and natural gases maintained at a positive pressure within the retort. Cycle time is five and one-half to eight hours at a temperature of 1700 degrees F. The resultant carburized case varies in depth from 0.025 to 0.040 inch as required.

When leaving the furnace, the parts drop into a sealed oil quench. They are removed by a spiral conveyor and fed into a reheat furnace. Here, the parts are hardened at 1510 degrees F. and again quenched in oil. Tempering is done in the third furnace in the line, operating at 360 degrees F. From there the parts on the cup

Fig. 1. Heat-treating department is set up for straight-line production. Cones are processed through carburizing, hardening, and tempering furnaces with oil quenching following carburizing and hardening.



**Fig. 2. Centerless grinding outside of bearing cups at the rate of seventy pieces per minute. The spiral storage rack above the machine provides lag time between grinding operations.**

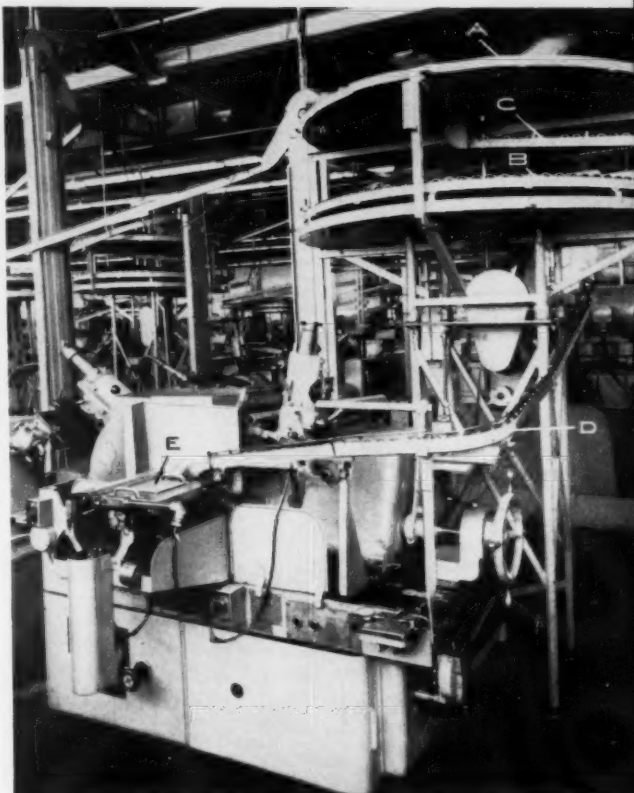
lines are once again deposited in bulk storage bins of two days' productive capacity. Before entering the storage bins on the cone lines, the parts pass through Almco tumbling barrels to be sure the undercuts at either end of the bearing race are free of chips and other particles.

Grinding of the faces is the first step after heat-treating on the cup lines. The cups are automatically fed from the storage bins through Gardner double-disc grinding machines. A tolerance of plus or minus 0.002 inch is held between the faces.

Short-period storage facilities are provided at various points in the lines. One of these is shown in Fig. 2. After leaving the face-grinding machine the cups are elevated to the upper wheel A of the two storage wheels shown. The parts roll around the spiral track to the center, pass down to the lower storage wheel B in chute C, and travel the same route. The storage wheels are stationary, but the parts are kept moving by four rotating brushes suspended over each wheel. A two-hour supply of parts is held by this unit so that the subsequent machining operations can continue for that period of time should the incoming flow of parts be temporarily halted.

In Fig. 2 is shown a No. 2 Cincinnati centerless grinding machine. Cups roll down chute D from the lower storage wheel and drop, one at a time, in front of slide E. This slide, which is moved by a system of weights, backs off to let each part fall into feeding position. The slide advances with gentle, uniform pressure and forces the cup against those already being ground. It is thus fed between the grinding and regulating wheels. The cups are not supported on an arbor but pass through in a continuous stream. Cups are rough-ground in this operation, then passed through a second and similar setup where they are finish-ground to a total tolerance of 0.001 inch.

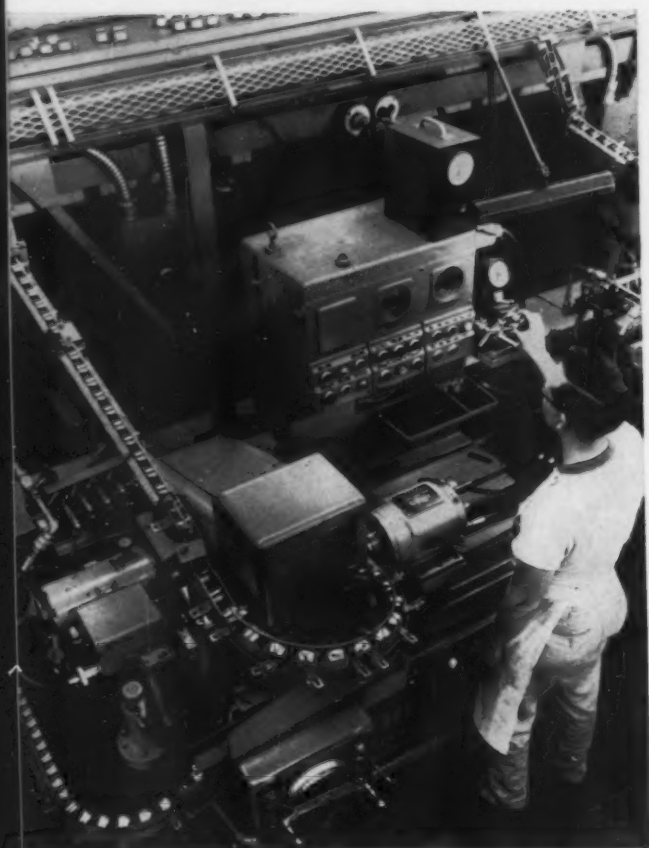
Some of the succeeding operations on the cup line are grinding of the tapered bore on a bank of No. 10 Heald centerless bore-grinding machines and honing this same bore on a bank of company designed machines. The bore-grinding machine locates the part between two pressure rolls and one drive roll, and against a back-plate. Honing of the tapered bore is done by a reciprocating abrasive tape. After each piece is completed, the tape advances to present a fresh gritted surface to the next cup.



Application of the unique materials-handling system can be seen on a broad scale in the heading illustration. Conveyors, chutes, and elevators are shown connecting the different machining operations in this section of the cone finishing department.

A vital link in this system is an overhead distributing conveyor belt. One of these distributing conveyors services each of the grinding departments and the honing department. For example, cones are gravity-fed down a chute from the No. 1 Cincinnati Micro-Centric grinding machine that finishes the tapered races and come to rest on the distributing conveyor shown at the top of Fig. 3. Each of the Heald Centri-Matic machines in this bank has an inclined chute leading to it from the conveyor. The cones move in a continuous circle above the machines and are immediately available to the down chutes that can accept another part. Two purposes are served by the distributing conveyor belts: first, to supply all the machines in the bank with sufficient work; and second, to serve as a storage facility if parts are being received faster than they can be handled by the machines.

Cones entering the Heald bore-grinding machine are rotated by a magnetic work driver. The grinding wheel enters the cone, rough-grinds



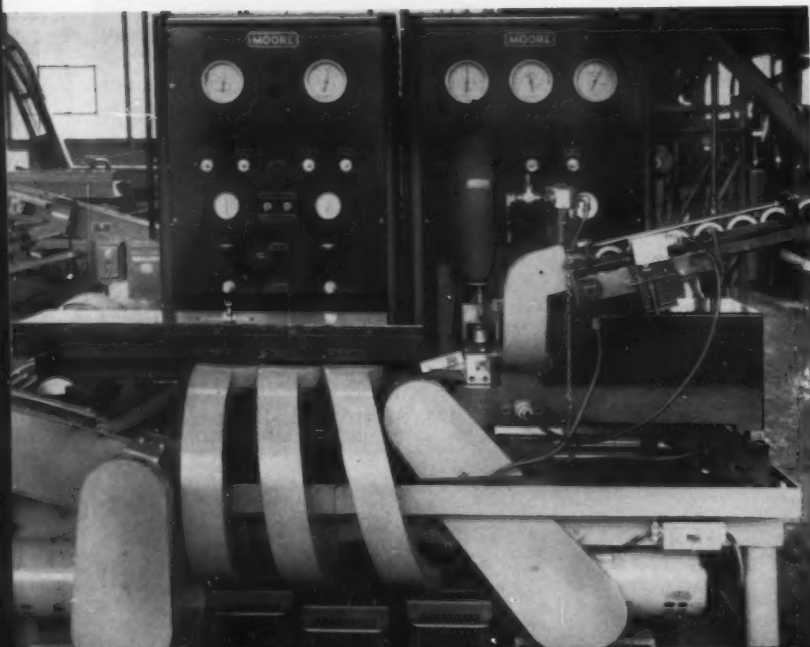
**Fig. 3.** Cone bores are being ground to a tolerance ranging from 0.0005 to 0.0008 inch in a cycle time of fourteen to twenty-five seconds. Distributing conveyor belt at top keeps entire bank of machines supplied with parts as they are needed.

the bore, sparks out, and is retracted. The abrasive wheel is then dressed and re-enters the cone to finish-grind the bore to a tolerance of plus 0.0000 minus 0.0005 inch. As the cones leave the machine through the chute seen in the lower left-hand corner of Fig. 3, they are demagnetized. An interlock system, operated by series of limit switches and photo-electric cells, stops machine operation when it has run out of parts to be processed, when the machine itself is malfunctioning, or when the product is being processed too fast for a subsequent operation in the line.

Tapered raceways on the cones are also honed on Timken-designed machines. As was the case on the cup line, these machines use abrasive tape instead of honing stones as the honing medium. While the cones are spun on two drive rollers, the tape reciprocates across the bearing race. A uniform finish of 8 micro-inches is obtained.

Cups and cones leaving the finishing departments are given a 100 per cent inspection on Moore automatic gaging units that simultaneously measure all critical dimensions. The gaging station in the cone line is seen in Fig. 4. Product flow is from right to left. Over-all length, outside diameter, taper, rib length, and bore are checked. Functioning by both electric and pneumatic means, the gage separates the cones into four classes: cone size within tolerance, under-size, oversize, and salvable rejects. Parts falling within the last three categories drop into individual baskets. Parts in the first category continue on their way to a visual inspection station.

Assembly of the cones, cages, and rollers is



**Fig. 4.** Automatic gaging unit in cone line simultaneously measures over-all length, outside diameter, raceway stand, taper, rib length, and bore. Cones are separated into four categories according to measured tolerances.



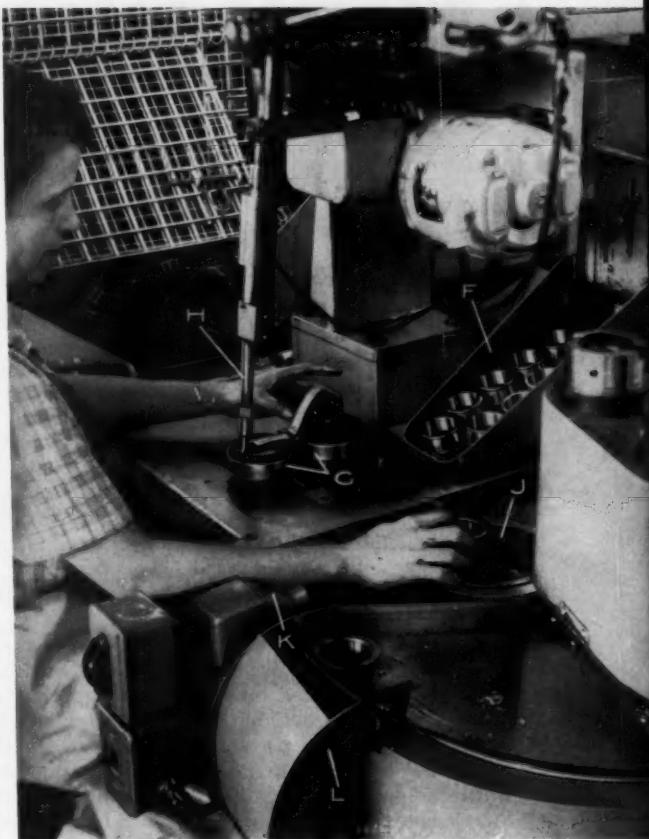
Fig. 5. Assembly of cone, cage, and rollers. Magnetic elevator brings rollers to the top of the feed-tube which, in turn, directs them into the cage. Closing-in press at right completes the assembly.

the only semi-automatic operation in the line. Cones are received from the visual inspection station via an oscillating conveyor leading to chute *F*. The operator places a cone in one of the two assembly nests *G* in an inverted position. A cage is then dropped over the cone. Rollers are elevated from a storage bin by means of a magnetic belt, demagnetized, and then dropped into feed-tube *H*.

From the feed-tube, the rollers drop in place between the cage and the cone as the assembly nest rotates. While one nest is receiving rollers, the second nest is being prepared. After being filled, the assembly is moved to one of two dies *J* in the indexing table of a Minster closing-in press at the right.

Movement of the operator's hand from the assembly nests to the closing-in press interrupts the beam of light passing between two photo-electric cells, one of which can be seen at *K*. Action of these cells causes the feed-tube to pivot and load rollers into the second nest. The press table then indexes and the bearing members are pressed together. After each indexing movement, the bearing previously assembled enters chute *L*, is elevated, and gravity-fed to a sound-proof booth.

In the test booth the bearings are run at high speed and under pressure to determine their quality. Assembled length is checked automatically. They then pass through a company-



designed washing installation, are dried, and are slushed in oil for rust prevention. At the end of the lines are packaging machines that stack predetermined numbers of bearings, insert them in tubes, cap and seal the tubes, and place them in boxes.

## Martin Tests Titanium for Hydrogen Content

Samples of titanium are tested regularly for hydrogen content at the Martin Co. with a vacuum fusion gas analysis apparatus developed by the National Research Corporation. The apparatus can also be used to determine the amount of various basic elements in other metals.

Minute amounts of impurities such as oxygen, hydrogen, carbon, and nitrogen may produce marked effects on the final properties of the metal. Although good strength combinations are possible with these interstitial alloying elements, other properties such as impact-strength and notch-toughness suffer disproportionately. For example, as little as 0.0125 per cent hydrogen will make certain alloys of titanium too brittle for forming operations.

Based on notched stress-rupture tests, the Air Force has specified a maximum hydrogen content of 150 parts per million in Ti-8Mn sheets, and 125 parts per million in bar and forging stock used in military aircraft. Martin is testing its titanium for hydrogen content to meet this specification. Occasionally, a full analysis is made to determine the amounts of nitrogen, carbon, and oxygen as well as the hydrogen. The apparatus used for this testing consists essentially of a Lepel high-frequency power source, an induction heating-furnace for driving off the gases from the metal sample, a collecting device for catching the gases, and a McLeod gage for reading their volume and pressure. Samples of titanium are weighed to an accuracy of 0.0001 gram.



# LATEST DEVELOPMENTS

Machine tools, unit mechanisms, machine parts and

## Buhr "Economatic" Equipped for Assembling and Machining Steering-Gear Components

A production rate of 489 steering-gear components per hour is obtained with a recently developed "Economatic" announced by the Buhr Machine Tool Co., Ann Arbor, Mich. This seven-station machine employs an improved production method that incorporates assembly with various machining operations.

Four pieces of work are manually loaded at the first station of this machine and secured in place by automatically operated power clamps. At the second station, the parts are spot-drilled preparatory to countersinking. Operations at the third station consist of drilling a through hole. End-cut reaming at the fourth station serves to

straighten the hole. The work is size-reamed for close hole tolerance at the fifth station, and a pin is pressed into the reamed hole at the sixth station. At the seventh, and last, station the four pieces are automatically released by the clamps and manually unloaded by the operator.

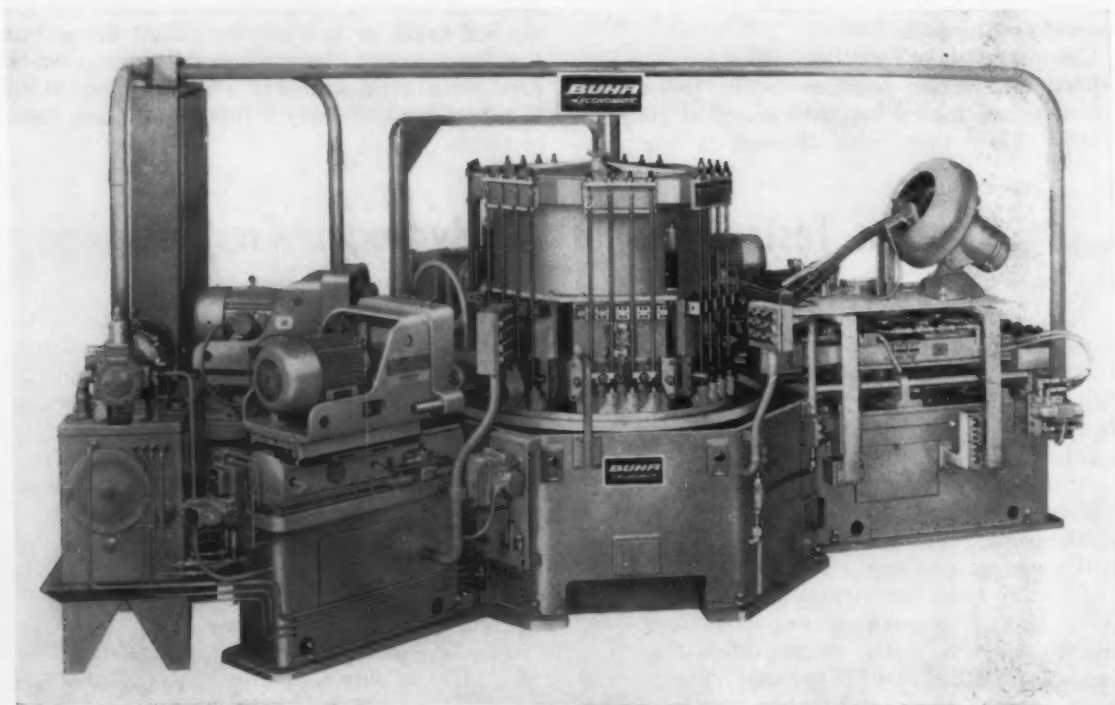
The automatic assembly unit incorporates a gripping device which unites the work-holding fixture and assembly unit into an integral mechanism. This design eliminates any excessive load on the index-table that might be generated by the force used to press the pins into the shafts in the assembling operation.

Individual hydraulic cylinders

are employed to press each pin into place and maintain the close positional tolerance required in the sub-assembly. A mounting pad has been provided on the periphery of the machine base in anticipation of automatic unloading of the parts.

Standard and special machine and fixture parts are precision machined for interchangeability and to facilitate maintenance. Automatic lubrication is provided for all moving parts. Other features include hardened and ground detachable steel ways; seven-position, power-operated index-table; and construction to JIC standards throughout.

Circle Item 101 on postcard, page 237



Seven-station Buhr "Economatic" equipped for high-speed processing of steering-gear components

# IN

# SHOP EQUIPMENT

material-handling appliances recently introduced

Edited by FREEMAN C. DUSTON

## SIP Hydroptic Boring and Milling Machine

The American SIP Corporation, New York City, has announced the Hydroptic-6A as addition to its line of jig boring and milling machines. This new machine has been designed specifically for drilling, boring and milling the increasing number and variety of parts requiring higher standards of accuracy.

Increased rigidity of design, completely new spindle head with heavier quill and larger spindle driving motor, together with pre-selection of spindle speeds and automatic tool clamping and releasing, are said to have raised production capacity 10 per cent above that of Hydroptic-6 machines. Output can be increased up to 30 per cent (depending on parts to be handled) when the machine is arranged with an automatic coordinate repeating device.

The prototype of the Hydroptic-6A was exhibited at the recent Machine Tool Exhibition, Hanover, Germany. The first production models will be shown at the ASTE Exhibition, Philadelphia, Pa., next spring.

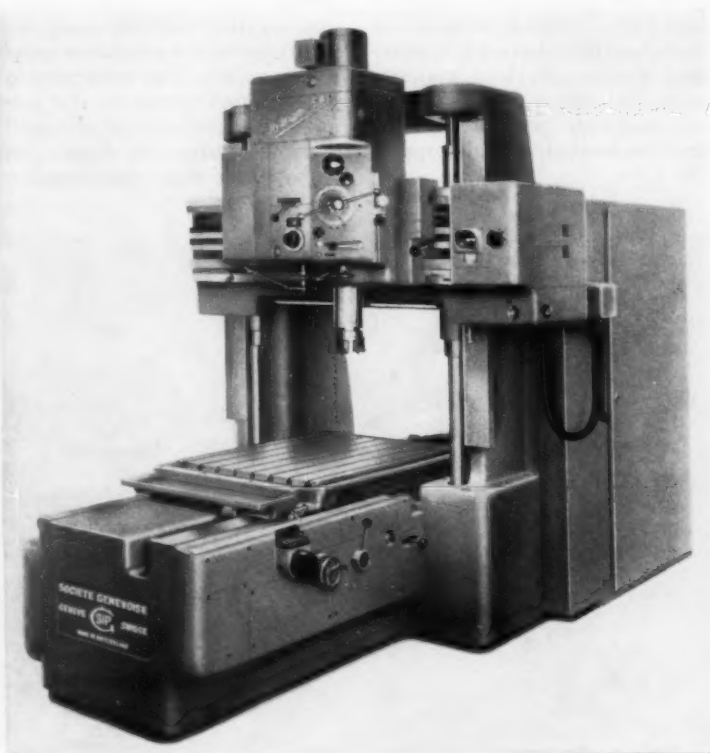
The enclosed optical measuring system is in English units, and the machine is calibrated at a standard temperature of 68 degrees F. The minute graduations on the standard scales incorporated in the work-table and spindle-head saddle are magnified and viewed on built-in projection screens having micrometer drums with verniers that read to 0.0001 inch. The numbered external reference scales, subdivided with ten lines to the inch (0.1 inch) are read for the approximate position, and final settings are made directly to the standard scales.

The automatic coordinate repeating device is an adaptation of a principle that uses the photo-

electric microscopes introduced in 1950 by SIP in the field of applied metrology on their longitudinal comparators and linear dividing engines. This unique repeating device is added to the normal optical measuring system and has photo-electric units incorporated in the bed and cross-rail for automatic and precise setting to the minute graduations on the standard scales. The electronic control for the units, including a magnetic memory drum, is in a separate cabinet and is connected to the machine by electrical cable.

When using this repeating device, the operator makes the initial settings in a conventional

manner, using the optical measuring system. In addition, each setting is registered by means of push-buttons. These registrations will record on the memory drum from one to twenty individual positions of the table and up to twenty individual spindle-head positions. Automatic repetition of more than twenty positions is possible when two or more of the locations have a common axis. The minimum distance between any two settings is 0.00004 inch, and the settings will repeat indefinitely with an accuracy of 40 millionths of an inch. Any individual registration of position can be cancelled from the drum or all regis-



Hydroptic boring and milling machine announced by American SIP Corporation

trations can simultaneously be erased from the drum. (Canceling of an individual position and resetting to a new position will not affect the other registrations.) The operator can visually verify the precision of the automatic setting at any time by checking the position of the graduation of the standard scale on the projection screen. The guaranteed accuracy for all displacements of the worktable and the spindle saddle of the machine is 0.00015 inch.

Two elevating lead-screws driven by a 1.3-hp motor provide vertical travel for the cross-rail that supports the spindle-head saddle on horizontal guide ways. The saddle is traversed by a vari-

able-speed motor which provides automatic milling feeds of  $1 \frac{3}{8}$ ,  $2 \frac{7}{8}$ ,  $4 \frac{3}{8}$  and  $8 \frac{5}{8}$  inches per minute in either direction and a rapid traverse of 60 inches per minute. The two-speed 8-hp spindle motor provides adequate power for drilling holes  $2 \frac{3}{8}$  inches in diameter in either cast iron or steel and for taking 4-inch by 1/4-inch milling cuts in cast iron with a feed rate up to 10 inches per minute. Eighteen spindle speeds ranging from 40 to 2000 rpm are available. The spindle motor is equipped with an automatic electric brake and there is a push-button spindle reverse rotation control for use in tapping.

Circle Item 102 on postcard, page 237

### Hydraulic Stretching Machine for Extruded or Rolled Shapes

A line of high-production hydraulic stretching and detwisting machines—in sizes up to 200 tons for straightening both ferrous and non-ferrous metal sections—has been placed on the market by Loma Machine Mfg. Co., Inc., New York City. These stretchers have been designed to handle extruded or rolled bars, tubes, structural shapes, or sheet material. Individual pieces from 4 to 100 feet in length or more can be stretcher-leveled at high production rates.

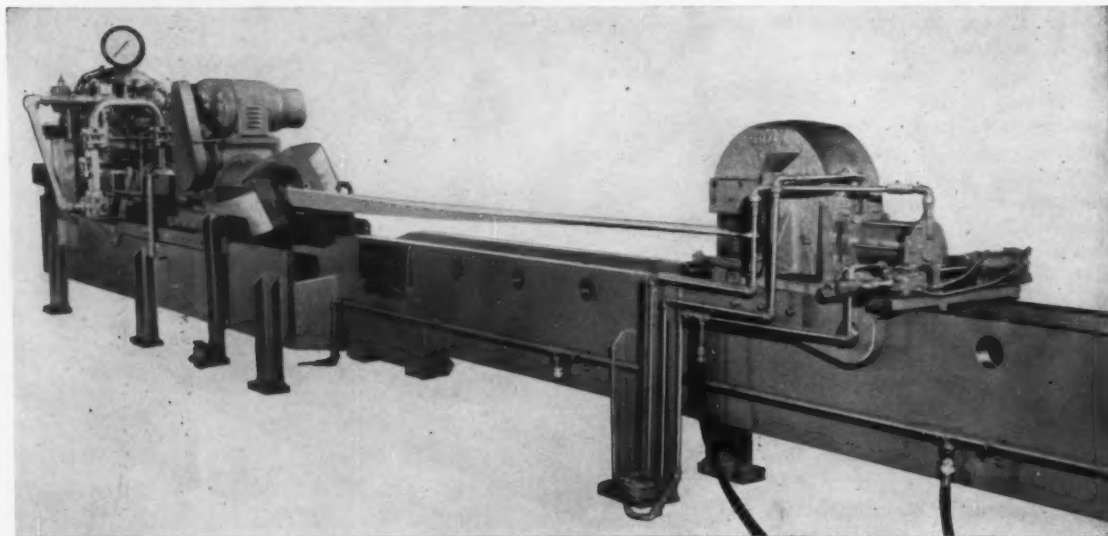
An outstanding feature of the stretchers is their optional availability with a special open tailstock, designed to allow the stock to protrude past the gripping jaws. With this equipment, extrusions of varying lengths may be gripped and stretched without moving the tailstock every time or trimming the extrusions to uniform length. The new arrangement allows extremely fast loading and unloading and also facilitates detwisting of shapes over only part of their total length.

These stretchers are completely self-contained. The oil-hydraulic power units are conveniently mounted above the stretching cylinder. To facilitate rapid setup for varying lengths, the tailstock has power travel, and its anchoring pins are engaged or withdrawn by an air cylinder. The gripping jaws in both the headstock and tailstock are moved by air cylinders and controlled by conveniently mounted foot-operated valves. The detwisting motion is applied to the headstock by a brakemotor driving through worm gearing, with unlimited rotation in both directions.

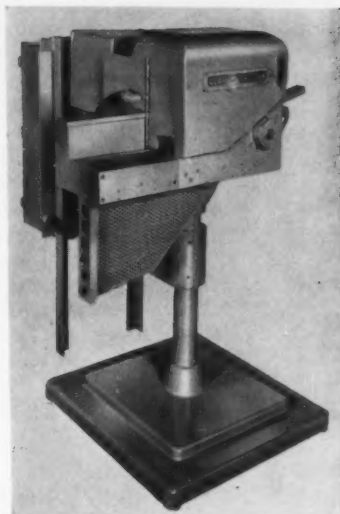
The headstock, which performs the stretching movement, is connected to the stretching cylinder by long tie bars and a cross-head attached to the end of the piston-rod. The latter is of extra large diameter so that the displacement at the piston-rod end of the cylinder is greatly reduced. The full cylinder area is available for the generation of the stretching force, while for the movements in the opposite direction high return speeds are automatically produced.

The oil-hydraulic power unit for the operation of the stretching cylinder comprises two pumps—one low-pressure pump of large volume capacity, and one high-pressure pump of small output.

Circle Item 103 on postcard, page 237



Loma 50-ton hydraulic stretching and detwisting machine



Red Ring automated electronic classifier that sorts gears into accurate size ranges for assembly operations

### Red Ring Gear-Classifying Machine

A Red Ring Model GRF automated electronic gear classifier that sorts gears into size ranges for assembly operations is announced by the National Broach & Machine Co., Detroit, Mich. This machine is adapted to the production of gears used in planetary and related types of gear sets where equalized backlash and loading conditions are desired in finished assemblies.

Extreme accuracy of size measurement is achieved by utilizing a double-pivoted mounting for the upper non-rotating master gear. This arrangement permits true size measurement of spur or helical gears, regardless of helix angle variations. Another feature contributing to extreme accuracy of the unit is the synchronized engagement of the same tooth of the motor-driven lower master with each gear to be measured. This completely eliminates the effect of minute master gear tooth or shaft bearing eccentricities. Both upper and lower master gears can be rotated to new tooth meshing positions.

The model illustrated classifies 1-inch diameter helical automotive automatic transmission pinions into "undersize," "oversize" and four-tooth size ranges, each

differing from the other in thickness by 0.0004 inch as measured over pins.

The pinions are fed into the classifier from the production line. Size measurement is made by passing each pinion between a pair of master gears. Center distance movement of the upper master gear as each pinion passes through is measured by a sensing unit of the linear variable differential transformer type. Elec-

tronic controls amplify the signal from the transformer and cause solenoids to open a door in the exit chute of the classifier that corresponds to a particular size reading. Thus the pinions are automatically measured, classified, and directed into proper size chutes for the assembly operation. The classifier is pedestal-mounted and has an integral electronic and push-button control panel.

Circle Item 104 on postcard, page 237

### Moline Ten-Unit Transfer Machine for Processing V-8 Engine Blocks

The Moline Tool Co., Moline, Ill., recently completed a ten-unit transfer machine for multiple machining operations on V-8 engine blocks for automobiles. While each engine block passes through the various stations of this equipment, the eight cylinders are rough-bored, semifinish-bored, and counterbored, and both ends of each cylinder are chamfered; also the valve clearances are machined.

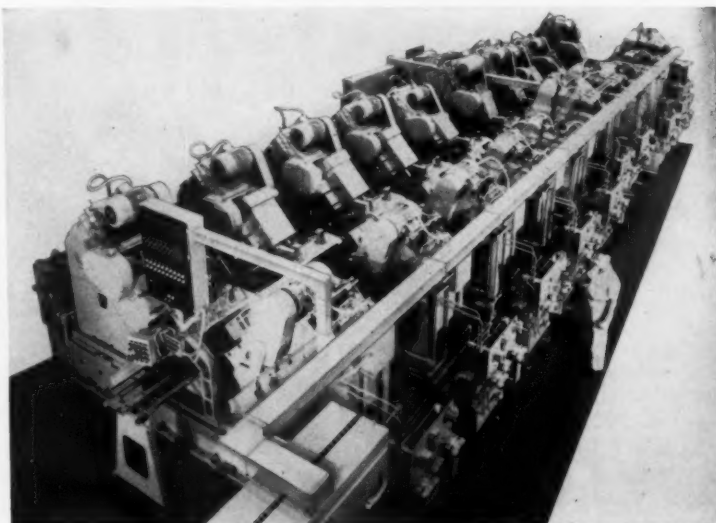
An idle station between each two working stations permits the work-pieces to lose some of the heat generated by the machining operations. Every vee type machine unit has two hydraulic feed pumps, each on a floor-mounted reservoir for hydraulic oil. Automatic lubrication of slides, ways, spindles and gears is included,

with electrical interlocking to detect and protect the machine in case the oil supply fails or is accidentally cut off.

An electric control panel is provided for each machine unit in the steel control enclosures. Each machine unit has its own push-button station for individual emergency operation and also individual electric control for each slide so that tools can be moved to or from the work for adjustments.

All functions are electrically connected so that the entire equipment can operate as an integrated machine. Control is centralized in one push-button station mounted on a movable arm which can be swung to either side of the feeder station at the beginning of the transfer line.

Circle Item 105 on postcard, page 237



Transfer machine for processing V-8 engine blocks built by Moline Tool Co.



## Ex-Cell-O Boring Machines

Two standard precision boring machines that are considerably larger than its other standard models are being introduced by the Ex-Cell-O Corporation, Detroit, Mich. One is a double-end and the other a single-end machine. Both are designed for precision boring, turning, facing, grooving, and chamfering, and for performing these operations singly or in combination.

The new models have all the features developed to increase the accuracy and production capacity of the smaller machines and, in addition, they have extra power, size, and rigidity for machining large and bulky parts or for performing simultaneous operations on a number of parts. A simple control system that is easy to set up and operate, together with a selection of standard spindles and drives, gives these machines unusual versatility.

The double-end model, Style 2440, illustrated, has two bridges that support the spindles and their drive equipment. These bridges are 54 inches wide to accommodate a number of spindles. Also, they can be spread apart to take large work-pieces and moved

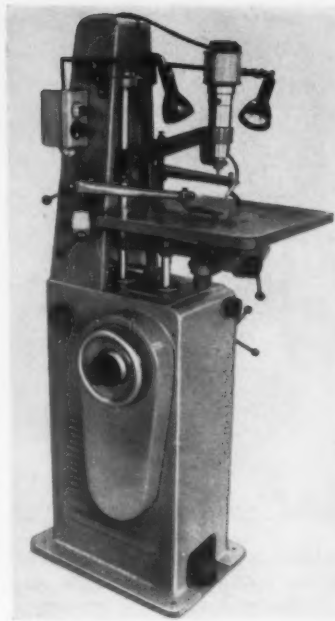
close together for fast operating cycles on smaller parts. The maximum length of the table stroke is 40 inches, and table fixture pad dimensions are 28 inches by 46 inches. The single-end model, Style 1440, is identical to the Style 2440 except that it is supplied with only one bridge, which is mounted on the left-hand end of the machine.

Circle Item 106 on postcard, page 237

## "Roto-Recipro" Tool-making Machine

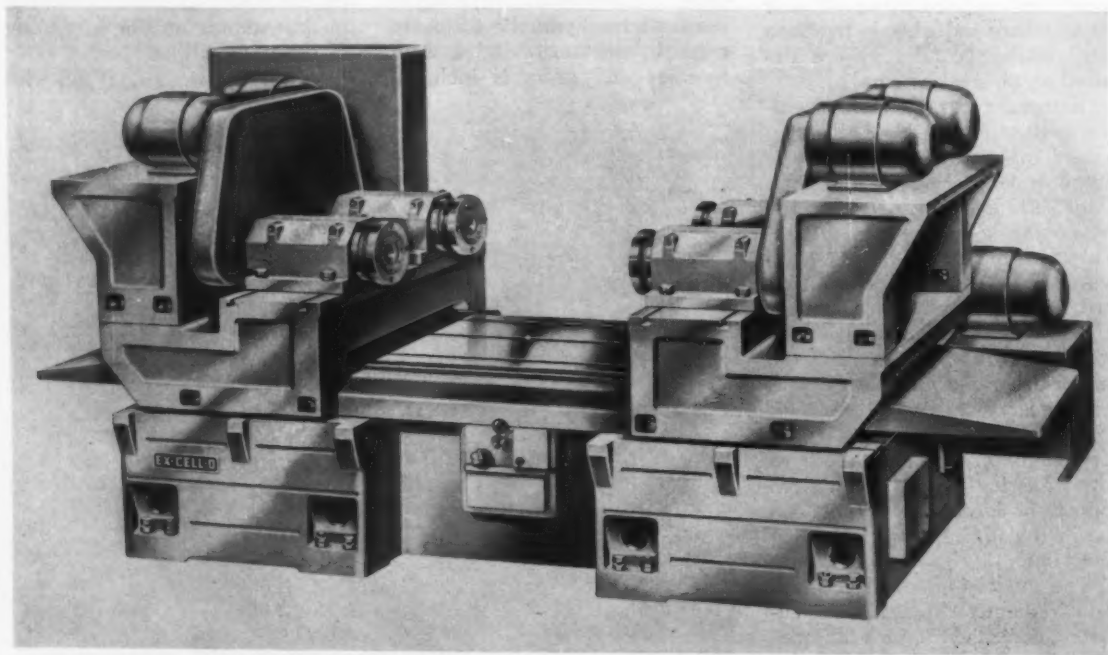
The Connecticut Tool & Engineering Co., Fairfield, Conn., is introducing the Williams "Roto-Recipro" toolmaking machine which provides a method of applying rotary and reciprocating motions simultaneously. With this method, machining of all types of tool steels, carbide form-cutting tools, contoured tungsten-carbides, and hardened steels is said to be achieved efficiently and economically.

Inexpensive diamond tools, carbide files, grinding points, and carbide burrs are utilized in carrying out this machining process.



Williams "Roto-Recipro" toolmaking machine introduced by the Connecticut Tool & Engineering Co.

Also, conventional tension and compression filing, as well as sawing and honing, is obtainable through the use of an interchangeable file bracket. Features of this machine include a recipro-



Double-end model boring machine introduced by the Ex-Cell-O Corporation

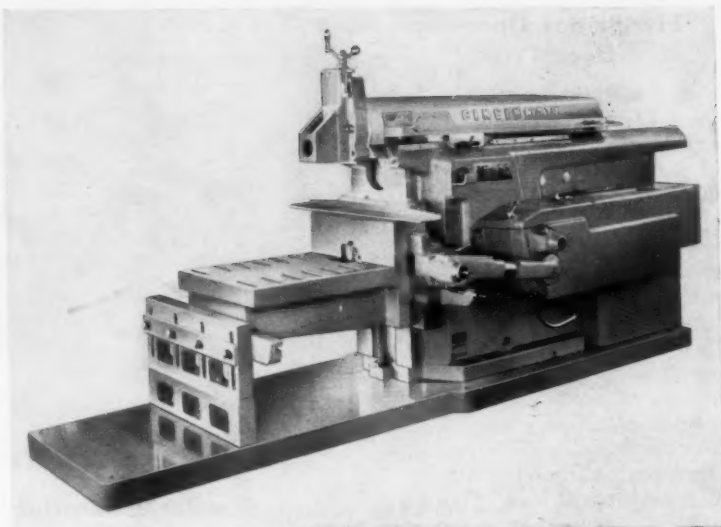
cating motion infinitely adjustable with a range of 85 to 500 strokes per minute, combined with rotary speeds rheostatically controlled up to 45,000 rpm. The fluted work-table, 18 by 18 inches, is ground and flash-chrome finished for wear and friction resistance. Depth of throat provides machining capacity to center of 22-inch diameter with a table tilt inclinable front or back, and left or right, to 10 degrees.

Circle Item 107 on postcard, page 237

### Cincinnati Heavy-Duty Rigid Shaper

The Cincinnati Shaper Co., Cincinnati, Ohio, has brought out a 36-inch heavy-duty rigid shaper equipped for machining internal gate valve guides. Features include automatic power down-feed to the special ram-head, special-clearance table to accommodate large castings, and extended steel baseplate.

Maximum rigidity is provided by slot-free ram and extended-ram bearing construction. An automatic lubrication system operating at a pressure of 50 psi maintains a pressured oil film on all



Cincinnati shaper equipped to machine internal gate valve guides

important bearing surfaces. Brushless electromagnetic clutch and brake with finger-tip control sim-

plify operation and reduce operator fatigue.

Circle Item 108 on postcard, page 237

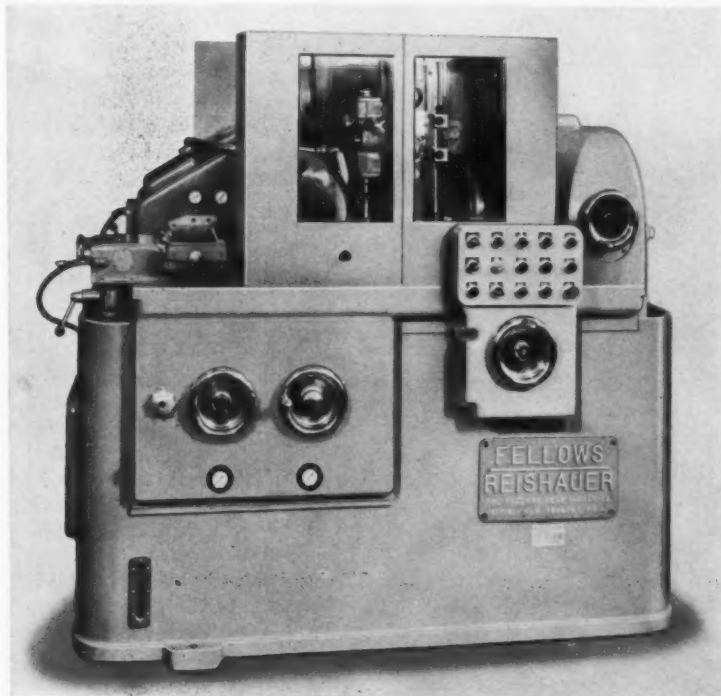
### Fellows-Reishauer Gear-Grinding Machine

The exclusive license to manufacture and sell the Swiss-made No. 12 Fellows-Reishauer gear-

grinding machine in the United States and Canada has been granted to the Fellows Gear Shaper Co., Springfield, Vt. This machine can grind spur and helical gears having outside diameters up to 12 inches and face widths up to 6 3/4 inches. The diametral pitch range is determined by the lead-screw selected. Two lead-screws are available, one covering from 6 to 48, and the other from 20 to 120 diametral pitch gears.

On this machine the gear-tooth shape is generated by an emery wheel on which a helix has been developed. The tooth section of the wheel is usually that of the basic involute rack. In operation, the involute is generated as the grinding wheel turns in harmony with the work while the work passes axially by the wheel. There is no mechanical connection between the wheel-spindle and the work-spindle—these are driven by synchronous motors. Grinding is done on both the forward and reverse movements of the work-slide. Machine setup is simple and fast, making possible low-cost grinding of single pieces as well as long production runs.

Circle Item 109 on postcard, page 237



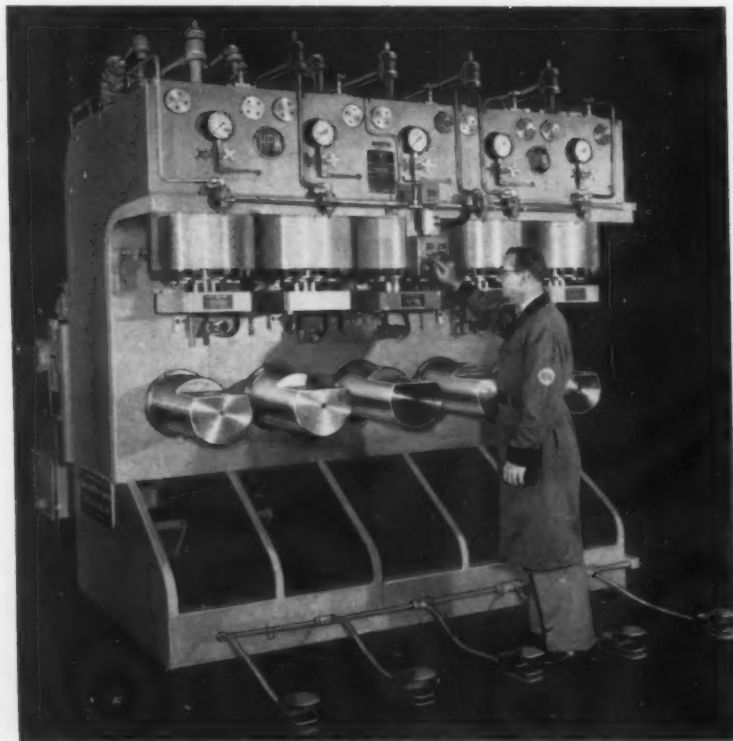
Fellows-Reishauer gear-grinding machine

### Five-Station Open-Gap Horn Press

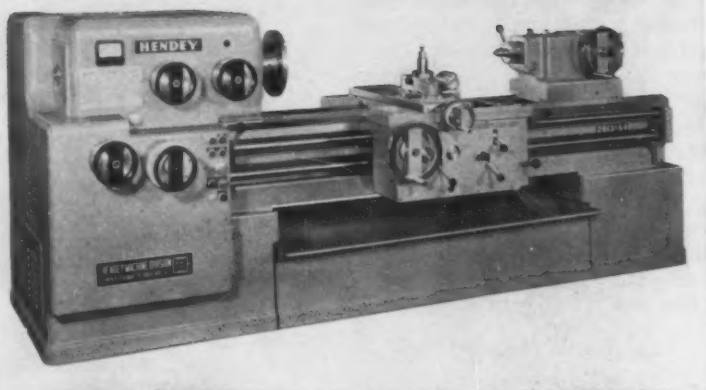
A five-station open-gap horn press has been built by the Hydraulic Press Mfg. Co., a Division of Koehring Co., Mount Gilead, Ohio, for punching and embossing operations formerly requiring several presses. One compact, welded steel frame houses five main cylinder and ram assemblies which are controlled individually by foot-pedal at the option of the operator.

Each of the five main rams has a pressure capacity of 100 tons. The tonnage range for each ram is adjustable from 100 tons to a minimum of 4 tons. Maximum daylight between ram adapter and horn is 12 inches; each ram has a 6-inch stroke. The diameter at the base of each horn is 11 inches. The length of the horn from the throat is 20 inches, and the distance from the throat to the center line of the ram is 15 inches. The entire unit is powered by a 50-hp electric motor and a radial type piston pump.

Circle Item 110 on postcard, page 237



H-P-M five-station open-gap horn press



Henley Model 2013 all-g geared head lathe with 21-inch swing over bed

### Henley Heavy-Duty Lathes for Toolroom and Production Work

A new line of 32-speed, all-g geared head lathes for toolroom and production turning is announced by the Henley Machine Division, Barber-Colman Co., Rockford, Ill. Two sizes, Model 2013 with a 21-inch swing over the bed ways and Model 2516 with a 25-inch swing over the ways, are

available. These models have been designed to combine the heavy-duty construction features needed for production work with toolroom versatility and precision.

The all-g geared head provides thirty-two spindle speeds ranging from 13 to 1500 rpm through crowned, flame-hardened spur gears. It is also available with maximum speeds of 1000 or 2000 rpm. Two large handwheels with easily read dials are used to select and shift spindle speeds, which are in geometric progression. Three sets of precision-tapered roller bearings support the spindle.

A large, two-speed tailstock permits rigid centering of work for high-speed turning. Despite its 400-pound weight, it can be positioned quickly and easily with one hand. The large, 4 1/2-inch diameter hardened and ground, tang-slotted tailstock spindle has a full 10-inch travel with a scale calibrated in sixteenths of an inch, and a slow speed for counterboring and fast speed for reaming or rapid positioning. A dial with 0.001-inch graduations is located at the handwheel.

A multiple-thread indexing spindle permits cutting any number of threads divisible into 48. There is a built-in thread-chasing dial on top of the apron that permits the operator to move the carriage quickly back to any position when cutting an even or odd number of threads. Quick-change spur gears mounted on involute splines

give sixty-six thread and feed changes selected through two dials on the gear-box. Quick-change gears provide a thread-cutting range from 2 to 120 threads per inch. The feed range is from 0.0015 to 0.091 inch per revolution.

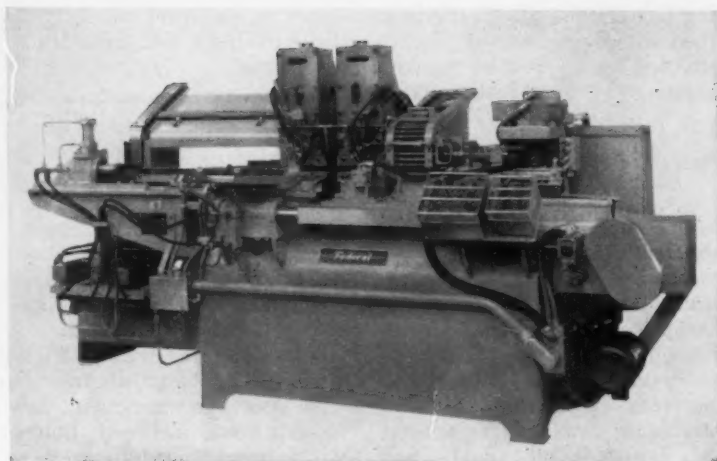
The lathes can be furnished with a 15-, 20- or 25-hp spindle-drive motor and come equipped with a load meter and spindle-speed selector plate.

Circle Item 111 on postcard, page 237

### Federal Automated Flash Welder

The Federal Machine & Welder Co., Warren, Ohio, has brought out an automated flash welder designed to resistance flash weld worms to the ends of automotive steering-gear shafts. Both parts are automatically fed from loading chutes, injected against a gage bar to obtain the correct welding position, and ejected after welding has been completed.

A marking device for the shaft and a radial positioner for the



Automated flash welder made by the Federal Machine & Welder Co.

worm are incorporated in this automatic welding machine. A safety feature stops continuous machine operation if the part-

loading chutes become empty. The welder incorporates a 150-kva transformer.

Circle Item 112 on postcard, page 237

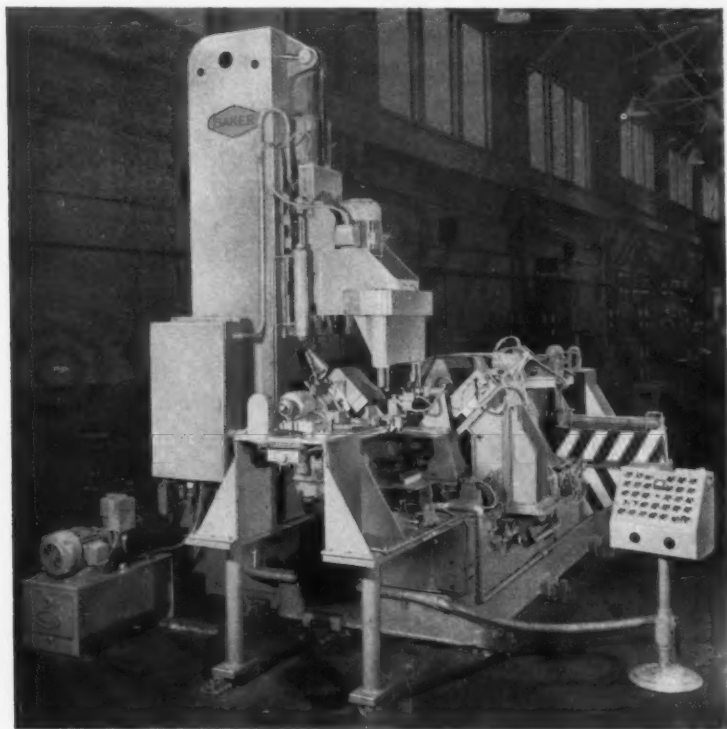
### Baker Machine Inspects Cylinder Walls and Drills Holes

The first operation performed on a special machine brought out by Baker Brothers, Inc., Toledo,

Ohio, is to determine whether V-8 cylinder blocks have walls that are too thin as a result of cores shifting during molding. By checking the cylinder blocks before machining, this equipment eliminates both material waste and lost machine time.

During molding, the water-jacket core sometimes shifts endwise in relation to the cylinder-bore cores. This produces a cylinder wall which is thin on one side and thick on the other. In order to compensate for this shift and to maintain a minimum permissible wall thickness, the block must be located from the water-jacket side for cylinder boring. If the core on one bank of cylinders shifts a different amount than the core on the other, the block must be located by an average or equalizing setting for the cylinder-boring operation.

This special machine automatically checks the wall thickness to a tolerance of  $\pm 0.001$  inch and locates the block to maintain the desired minimum. If this minimum wall thickness cannot be maintained, the block is automatically rejected and painted for identification; if it is acceptable, the vertical head advances and drills two locating or manufactur-



Machine for inspecting thickness of cylinder walls and drilling locating holes introduced by Baker Brothers



ing holes in the block. The head then withdraws and the block is shuttled to the next position for reaming the drilled holes. After

reaming, a mechanical device turns the block over for additional operations.

Circle Item 113 on postcard, page 237

### Cross Transfer-matic for Machining Rear-Axle Differential Gear Cases

One-piece automobile rear-axle differential gear cases are being machined on a new Transfer-matic developed by the Cross Company, Detroit, Mich. This machine performs difficult operations—formerly done on single-station machines—on the inside of a part. Machining two parts at a time, the Transfer-matic rough- and finish-forms the two spherical seats for the pinions; rough- and finish-bores and faces the two seats for the side gears; drills, bores, and reams the pinion shaft hole; drills and reams the lock-pin hole; and drills, chamfers, spot-faces, and reams twelve ring-gear mounting holes. The rated capacity of the machine is 212 pieces per hour at 100 per cent efficiency.

The gear cases are transferred through the machine on pallet type work-holding fixtures. Part location in the pallet fixture is from the ring-gear seat and one of the two end-bearing diameters, which are turned and ground in previous operations.

The machine features a system

for transferring, locating, and clamping the pallet fixtures. Movement from station to station is accomplished by two reciprocating transfer bars. At the forward end of the transfer stroke, elevators lift the pallets from the bars into engagement with fixed locating pins and rest buttons which are attached to overhead bridge structures. Wedges then backup the elevators to accurately secure the pallet fixtures in place.

In stations where internal boring and facing operations are performed, the overhead bridges also carry the cutters. As the pallets are elevated to the clamping position, the cutters enter the part through the casting window, and thus find their correct location relative to the gear case. After the cutting operations are completed, elevators lower the pallets onto the transfer bars which carry them to succeeding stations.

Transfer and indexing errors are minimized because the locating pins are positively fixed. Side gear and pinion locations are

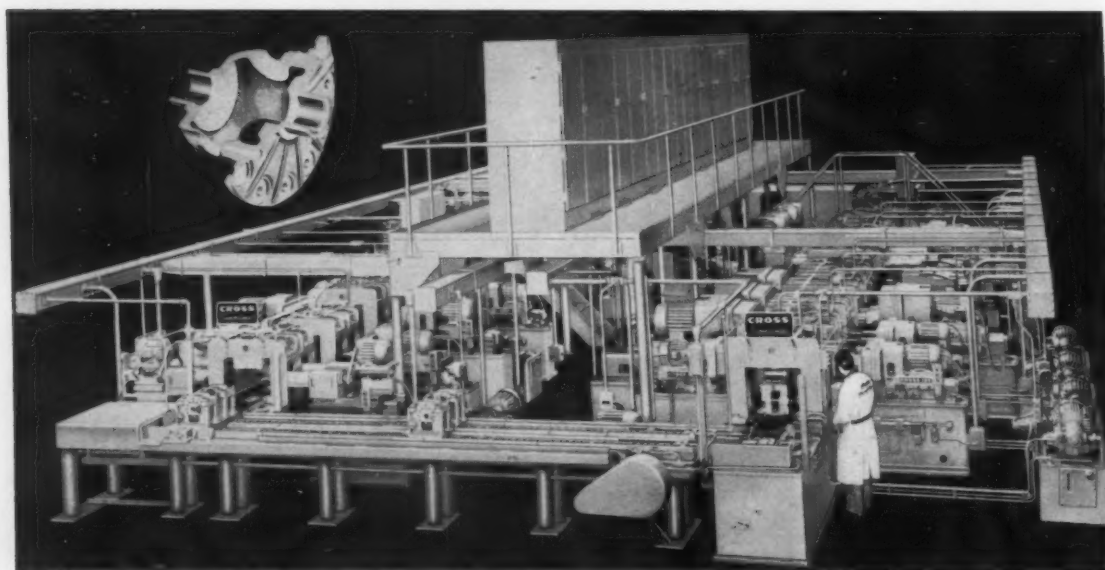
maintained in closer relationship because the parts are not relocated and clamped between operations.

The machine is constructed to JIC Standards, has hardened and ground ways, complete interchangeability of all standard and special parts, automatic lubrication, pre-set cutting tools and Cross tool changing program control.

Circle Item 114 on postcard, page 237

### Self-Enclosed Drilling Unit

An addition to the self-enclosed drilling power units made by the Drillmation Co., Center Line, Mich.,—Model 800 H.D.—recently solved a difficult problem for an aircraft manufacturer. A 3/4-inch diameter hole had to be drilled through a 1-inch thick super-alloy with a Rockwell hardness of 56-58 C and a tensile strength of 310,000 psi. After a few trials for speed and feed adjustments, this problem was solved by using the Drillmation Model 800 H.D. drilling unit illustrated and a standard carbide drill, with ordinary soluble oil as a coolant. With this equipment a hole was drilled through the 1-inch thick work in 80 seconds. Methods previously employed for this work required 105 minutes.



Transfer-matic machine for automobile rear-axle differential gear cases built by the Cross Company



Drillmation self-enclosed drilling unit



Madison gun drill for metalworking industry

The Model 800 H.D. has a self-contained, locked circuit hydraulic pump. The hydraulic locked circuit unit can be fed from 0.0003 to 0.025 inch per revolution at 300 rpm. Outstanding features of Drillmation units include: dull tool control; rapid tool change; uniform time cycle; self-contained hydraulic system; completely automatic operation; thrust control; feed control; rapid approach and return; micro depth control; emergency quill return; cool operation; and versatility as a production machine.

Circle Item 115 on postcard, page 237

### Gun Drill for Metalworking

A gun-drilling machine for the metalworking industry has been developed by Madison Industries, Inc., Muskegon, Mich. This drilling machine has a spindle speed of 8000 rpm, a feed rate of from 0 to 40 inches per minute, and will accommodate drills up to 1 inch in diameter. The work-piece is held in place as the tool rotates. The tool is driven by a 5-hp motor and has a horizontal stroke of 9 inches.

The machine base encloses a high-pressure coolant system that

delivers 7.6 gallons per minute at 1000 psi. This system has a 55-gallon tank mounted on casters and hinged to swing out from the base for easy access. A 5-hp motor drives the coolant through an air-oil feed mechanism in the head of the machine. Over-all dimensions of the complete unit are 90 by 63 7/8 inches and the shipping weight is 3000 lbs.

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### Lapping Equipment for Thin Work-Pieces

The Lapmaster Division of Crane Packing Co., Morton Grove, Ill., has introduced a new technique for obtaining critical flatness and parallelism in germanium, silicon, quartz, barium titanate, and lead-zirconate crystals and wafers. A lapping operation on a Lapmaster, in combination with the new patented Lapmaster diamond fixture, can produce a flatness under three light bands, a parallelism of 50 micro-inches and a thinness of 0.001 inch for the crystals or wafers.

In the first operation, the crystals or wafers are lapped on one side on a standard Lapmaster machine. In this operation, the crystals are lapped to approximately two light bands (23.2 millionths of an inch).

In the second operation, which consists of lapping the other side



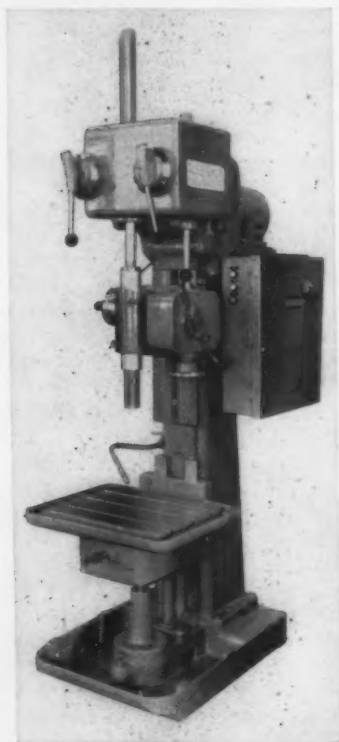
Precision lapping equipment for small thin parts announced by Crane Packing Co.

of the crystal, the blanks are affixed to a specially designed fixture for finish-lapping. The triangular plate of this fixture, lapped to a flatness of two light bands, has adjustable diamond stop points at each leg to limit the travel of the fixture in the lapping cycle. The diamond stops can be set to micro-inch accuracy to provide the desired crystal blank finish thickness. The diamond points, being extremely resistant to aluminum oxide abrasive, act as positive stops, thus predetermining the lapping operation to the limit set within the range of the abrasives' particle size.

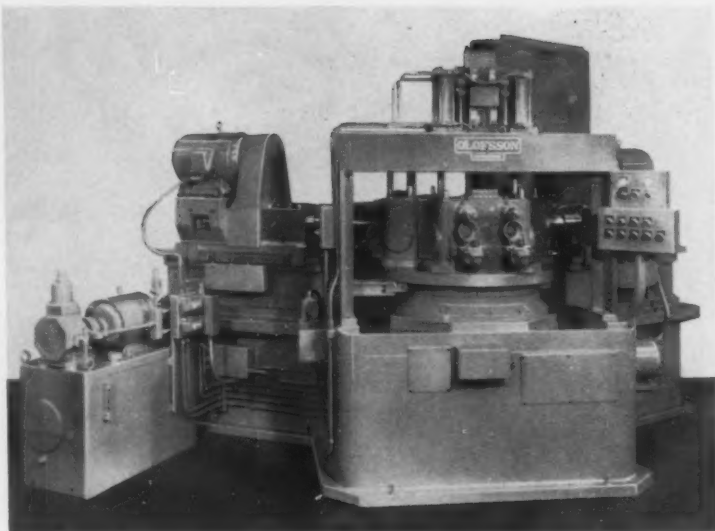
Circle Item 117 on postcard, page 237

### Cleereman Drilling and Tapping Machine

A 21-inch swing, upright drilling and tapping machine in box- and round-column types, in both single-spindle and gang-drill models, is announced by the Cleereman Machine Tool Corporation, Chicago, Ill. This Model



Versatile drilling and tapping machine announced by Cleereman Machine Tool Corporation



Three-station two-way boring machine announced by Olofsson Corporation

N machine has been designed to handle a broad range of work at high speeds. Single-lever functional control is provided to facilitate fast operation.

The spindle speeds and feeds can be arranged to suit practically any drilling or tapping job. A unique design feature not only permits unlimited feed rates but also provides for all standard geared tap leads from 8 to 50 pitch. Attachments and accessories are available for use on the machine.

Circle Item 118 on postcard, page 237

### Olofsson Three-Station Two-Way Boring Machine

A special precision boring machine which performs multiple operations on automotive body rear band servos has been announced by the Olofsson Corporation, Lansing, Mich. Two parts are loaded on the machine, and the clamp, start-cycle button is pressed. The machine then indexes to the next station where both parts are rough-bored, grooved, and the angle is formed. At the next station, the part is finish-bored to size within a tolerance of  $\pm 0.0005$  inch. The production rate, at 100 per cent efficiency, is 220 pieces per hour.

The entire operation is controlled from one electrical push-button panel located at the front

of the machine. Engineering features include hardened and ground steel V-ways; hydraulic tank and controls located outside the base for easy accessibility; and hydraulic and electrical circuits that conform to JIC standards.

Circle Item 119 on postcard, page 237

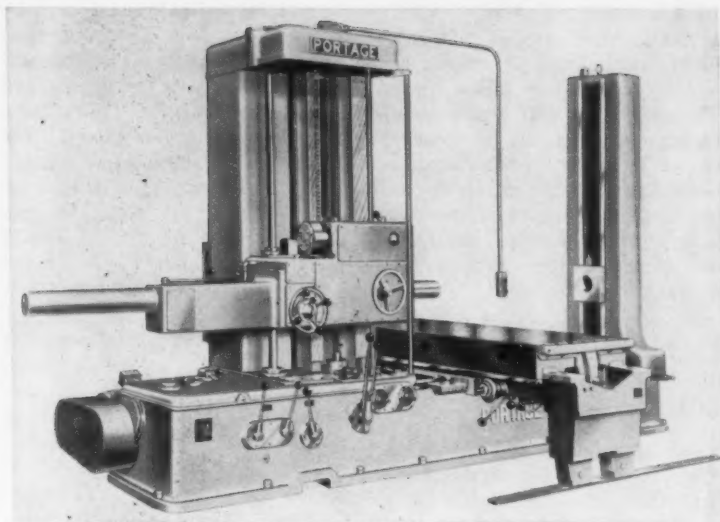
### Small-Size High-Torque Power Unit

The von Weise Gear Co., St. Louis, Mo., has designed and built a lightweight, low-cost gear-motor that weighs less than 5 1/2 pounds. This mechanism is equipped with a universal electric motor which has a rating of 1/15 hp; it is also available with motors of 1/10 and 1/6 hp. All motors are wired for instant reversing.

These power units are available from stock in six different ratios from 1787 to 1 down to 52 to 1 producing up to 450 inch-pounds torque. The output speeds at full load range from 2.8 to 100 rpm. Special ratios and voltages can be ordered.

This gear-motor is extremely compact in design; the over-all length being only 8 3/4 inches. The gears are precision cut and are totally enclosed in a sturdy die-cast housing, and they are lubricated for life.

Circle Item 120 on postcard, page 237



Horizontal boring, drilling, and milling machine announced by the Portage Machine Co.

### Portage Horizontal Boring, Drilling, and Milling Machine

The Portage Machine Co., Akron, Ohio, has announced a No. 5 horizontal boring, drilling, and milling machine equipped with a 5-inch diameter spindle. This machine weighs 36,000 pounds and is available with vertical head travel of 48 inches and cross travel of table on the saddle of 60 inches. The table working surface is 36 by 72 inches. Thirty-four spindle speeds ranging from 7 to 1000 rpm are available. Longitudinal travel of the saddle with the tailstock mounted is 52 inches.

Optional ranges and sizes include 36-, 60- and 72-inch vertical head travel and table working surfaces from 48 by 72 to 48 by 96 inches. Longitudinal saddle travel is available up to 100 inches and optional maximum distance of spindle sleeve to tail block is 138 inches.

The newly designed headstock has an independent motor-driven oil pump that insures a constant flow of oil to bearings and gears. A fan forces a flow of air through the headstock over ventilating ribs to dissipate heat from the spindle sleeve bearing. The heavy base, column, saddle, and head are ribbed for maximum rigidity.

Attachments and accessories include precision measuring devices (jig-bore attachments) for head

and table movement. Precision verniers, angular milling attachment, facing heads, auxiliary tables, rotary tables, and angle-plates represent a portion of the machine attachments and accessories available.

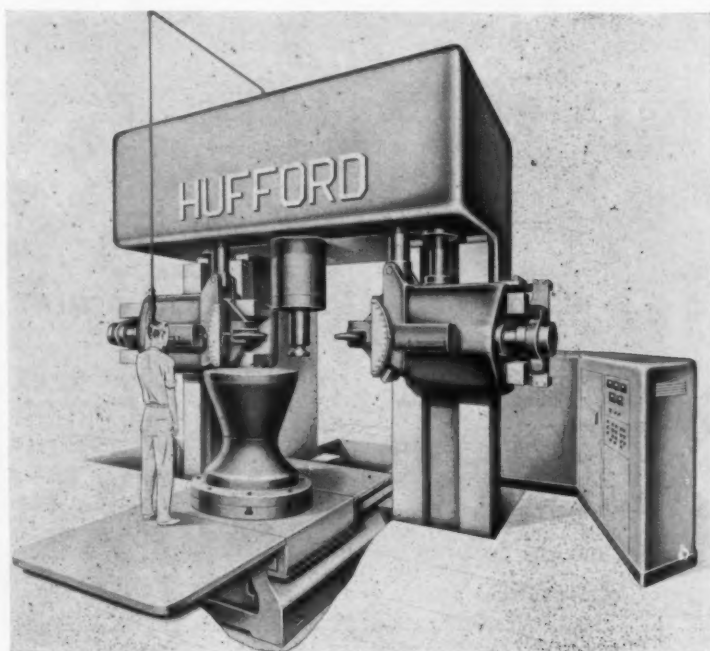
Circle Item 121 on postcard, page 237

### Hufford "Spin Forge"

A machine combining the features of a vertical spinning lathe with a roller type forging machine for forming and controlling the wall thickness of sheet metal parts has been announced by the Hufford Corporation, El Segundo, Calif. This machine—known as "Spin Forge"—makes it possible to form parabolic, hemispherical, conical, hourglass, and other shapes from a single piece. In addition, it provides facilities for forging the metal, varying the wall thickness from a full inch to as little as a few thousandths of an inch.

The force used for spinning and forging is applied by two opposed, hydraulically actuated rollers that are fed vertically down the form, longitudinally into die contours, and (being mounted on angular-tilting heads) can follow all contours maintaining a right-angle contact with the work surface. Travel of the rollers in all directions is tracer-controlled, following templates automatically. Each roller works independently of the other in any of its several motions.

The die, contoured to the shape of the finished part, is mounted



"Spin Forge" brought out by the Hufford Corporation



on a rotating table having spindle speeds up to 400 rpm. The entire table and spindle are carried on a slide which can be moved outwardly from the forming position. This simplifies loading and removal of parts without overhead barriers and reduces over-all height requirements of the massive structure. Power for the spindle drive is furnished by a 200-hp motor. A 225,000-pound forming force is supplied to each roll

by hydraulic cylinders operating at 3000 psi. The feed rate is 60 inches per minute.

The system includes a closed TV circuit with two Hallamore cameras and screens for close-up vision from a remote location, providing operator safety in case of part failure. Other circuits provide for programming the forming operations for automatic duplication of parts.

Circle Item 122 on postcard, page 237

### Waldes Quick-Action Stressed-Panel Fastener for Aircraft and Missiles

A new patented quick-action stressed-panel fastener that will withstand high shear and tensile loads, lock positively in less than one-half torque-free turn, and compensate automatically for sheet separation resulting from warpage or deformation in the panels being secured has been announced by Waldes Kohinoor, Inc., Long Island City, N. Y.

Known as Waldes QAF, this device is intended for use on structural load-carrying panels in aircraft, guided missiles, and

other applications where quick access to service areas is required. It has been used with satisfactory results on a structural fuselage panel of a B-47 bomber during test flights conducted by the United States Air Force and exceeds the strength specifications of National Aircraft Standard (NAS) No. 547.

The fastener has two major components: a retained stud assembly, and a receptacle assembly. The stud assembly, available in both a flush and protruding-

head type, is held in the panel by a retaining ring. The receptacle assembly is riveted to the airframe. The fastener is engaged simply by pushing the stud—a high lead screw with a deep No. 2 Phillips recess—into the receptacle by hand or with a screwdriver. An audible click indicates the stud has been secured in a split nut in the receptacle and that the panels being fastened are held loosely in place.

The split nut moves in a tapered housing. As the screw is turned, the nut is wedged into the narrower part of the housing until it is locked in place. Less than one-half torque-free turn is required to lock the fastener. To disengage the stud and receptacle the procedure is reversed; the pre-load is released so that the stud is loose but still engaged. The screw is then disengaged from the nut, after which it is ejected automatically from the receptacle. Disengagement is accomplished in less than one full turn.

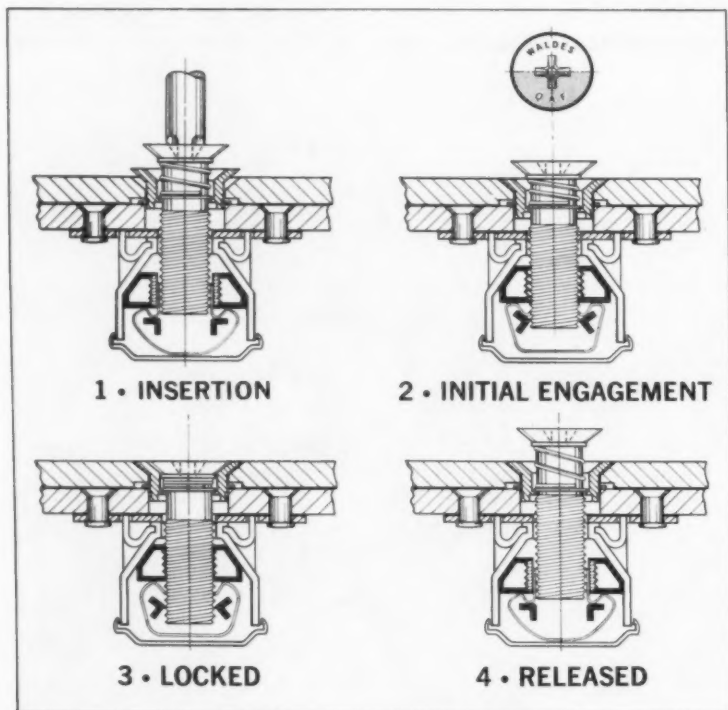
Circle Item 123 on postcard, page 237

### Carborundum Mounted Wheels in Standard Sizes

A line of mounted grinding wheels in all standard shapes and sizes and in a complete range of gradings to meet all precision grinding requirements has been announced by the Carborundum Company, Niagara Falls, N. Y. A new type of stronger vitrified bond previously introduced for toolroom grinding wheels, known as V40, gives these wheels exceptional strength and free-cutting qualities. The V40 bond permits extra-fast stock removal with a minimum of pressure. Another characteristic of this bond is its ability to hold size and shape exceptionally well, even on hard and tough metals.

All V40 mounted wheels are finished to run true for use on high-speed portable grinding machines employed for delicate touch-up operations. These mounted wheels can be supplied with hard, nickel-plated mandrels in a variety of sizes to fit various chucks. A special hard, high-strength cement is used for anchoring the abrasive.

Circle Item 124 on postcard, page 237



Cross-section views showing construction and operation of Waldes quick-action fastener

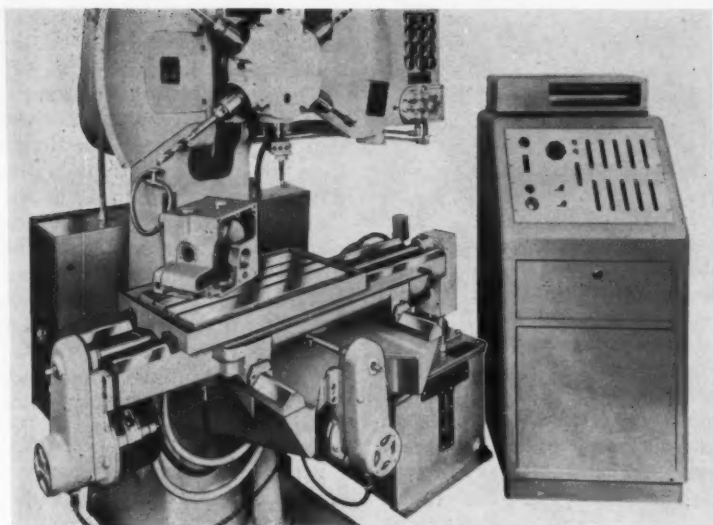


Fig. 1. Burgmaster turret drill with tape-controlled table

### Burgmaster Automatic Tape-Controlled Positioning Table

The Burg Tool Mfg. Co., Inc., Gardena, Calif., has announced a completely automatic tape-controlled two-axis positioning table, Fig. 1, as accessory to the Burgmaster multiple-spindle turret drill. The flexibility of the standard Burgmaster six- or eight-spindle drill has been combined with the numerically controlled positioning table to provide an efficient means for handling both prototype and production work. Speed, feed and precision depth control, and rapid approach and return movements of each spindle are controlled individually by the standard Burgmaster drill. Selection of the spindles and table positions for either the six- or eight-spindle drill are programmed on the tape. The unattended system then operates accurately and quickly through a complex cycle of drilling, tapping, reaming, and boring operations.

The two-axis positioning table is made up of the following elements: tape reader and command unit; comparison unit; servo control and table drive unit; digitizer; display; and positioning table.

Operation of the automatic tape-controlled table is shown diagrammatically in Fig. 2. The system power switch is first turned on. Then the prepared tape loop is installed in the tape command

unit and advanced manually to the start position. The "ready" light then indicates that the system can accept a semi-automatic or automatic cycle. When the "operate" button is pushed and the system is in automatic (see diagram) the tape is advanced to the first position where the desired X and Y positions are read simultaneously, together with the desired turret sequence.

The X and Y positional data are

next fed to the respective X and Y comparison units and the first turret position to the turret control relay unit. The comparison unit will immediately develop an error voltage which will drive the table in the correct direction. While the table moves, its instantaneous positions in X and Y are read by the digitizers and fed into the appropriate comparison unit. As the table position approaches the command position, the error voltage decreases and the table speed decreases until zero error exists.

A coincidence pulse then initiates table clamping and starts the first drilling operation. At the completion of this, any further drilling operations at this position are performed in the sequence punched on the tape. After completing the final drilling operation an advance pulse is generated by raising the spindle, and the tape is advanced to the next position where the cycle is repeated.

Alternatively a "stop" command punched as part of a sequence command will hold the system at the existing position. When the semi-automatic switch is used the system does not automatically step through the programmed cycle. The tape-advance button must be depressed to advance the tape to the next command and the sequence advance button de-

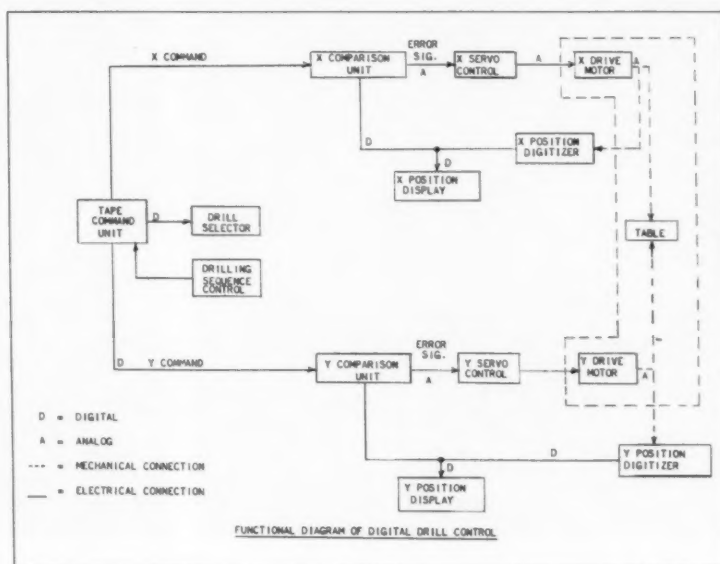


Fig. 2. Diagram of digital drill control of machine shown in Fig. 1

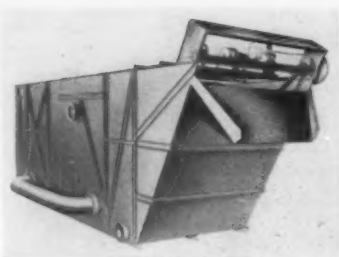
pressed for spindle advance. The semi-automatic switch is useful in checking individual operations.

At all times a vertically reading neon display panel indicates the spindle in operation and the exact position of the table in both X and Y positions within accuracy limits of 0.001 inch. This display is controlled by the output of the digitizers, which are mechanically coupled to the table and therefore indicate the actual table position and not the commanded position.

Circle Item 125 on postcard, page 237

### Filter for Cutting Oils and Grinding Coolants

The Industrial Filtration Co., Lebanon, Ind., announces that its "Filter-Matic" tubular screen vacuum filter has been increased in capacity to handle water flow rates up to 1000 gallons per minute. This filter is designed specifically for the filtration of grinding coolants and cutting oils and to make micro-inch finishes more easily attainable. Filtration is accomplished by tubular screen elements manifolded into a suction header box in which a vacuum equivalent to 18 inches of mercury is maintained.



Delpark "Filter-Matic" coolant and cutting-oil filter

Automatic, self-cleaning is accomplished by a float-activated micro switch which energizes an air valve and cylinder and reverses the coolant flow through the manifold into the tubes,

knocking off the filtered deposits held on the periphery of the tubular screens.

The sediment from the screens is removed by chain-driven flights which deposit the sludge in a tote box for disposal. The flow of coolant to or from the filter is not interrupted during the cleaning cycle. Filter aids may be used for pre-coating the screens when absolute filtration is required. An automatic pre-coat feeder is supplied as optional equipment. Multiple units are used for recommended capacities over 1000 gallons per minute. Smaller units are available from 5 gallons per minute up.

Circle Item 126 on postcard, page 237

### Canton Deep-Hole Drilling Machine for Special Atomic Plate Drilling Operation

The Canton Tool Mfg. Co., East Canton, Ohio, has completed an unusual deep-hole drilling job on an atomic core-plate for the Westinghouse Electric Corporation, using a Canton deep-hole driller like the one shown in Fig. 1, equipped with control panel illustrated in Fig. 2. The 30,000-pound atomic plate is 7 feet high, 18

inches thick, and was forged from 347 stainless steel.

Exceptional accuracy and speed were obtained in handling this work on the deep-hole driller which repeatedly thrust a 13/16-inch drill through the 18 inches of stainless steel to remove 6-inch squares of metal. With this method costly material was sal-

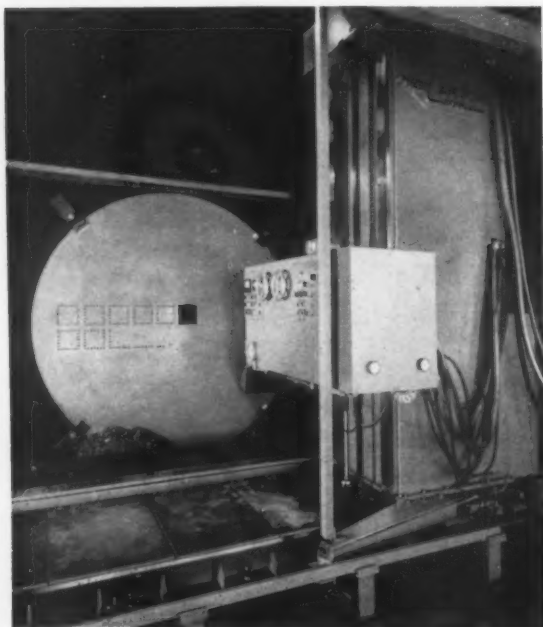


Fig. 1. (Left) Deep-hole driller built by Canton Tool Mfg. Co. and (right), Fig. 2, close-up view of control panel and atomic core-plate drilled on this machine

vaged, and, even more important, there resulted a considerable saving of time and the elimination of work on the next operation.

Circle Item 127 on postcard, page 237

### Waterbury Farrel Rotary Die Threader

The Waterbury Farrel Foundry & Machine Co., Waterbury, Conn., has brought out a rotary die threader for thread-rolling production on long or short runs. This machine, employing a circular die and die segment, can thread all types of machine screws as well as headed parts. The threader will handle blanks from 1/4 inch to 2 inches long and thread diameters from No. 6 to 1/4 inch.

Production rates obtained on blanks of conventional screw materials such as steel, brass, and other alloys range from 200 to 600 per minute. Stainless-steel blanks can be threaded at the rate of from 60 to 200 per minute, depending on size of blank.

A safety shear-pin in the fly-wheel protects the dies if an over-size, bent, or deformed blank comes through the feeding chute.

A separately-driven rotor vane feed is used, and a four-step pulley arrangement allows the operator to select the feeding speed.

The machine is equipped with a variable-speed motor drive to

permit varying production speeds but can be supplied with a single-speed motor. An attachment for knurling the head of the blank can also be provided as special equipment.

Circle Item 128 on postcard, page 237

### Ettco Adjustable Multiple-Spindle Drilling or Tapping Heads

Two models of a new universal ball-joint adjustable multiple-spindle head have been added to the line of Ettco-Emrick small hole drilling and tapping equipment made by the Ettco Tool & Machine Co., Inc., Brooklyn, N. Y. Both models feature a circle type spindle arrangement. Model 600 has six spindles and Model 800 has eight spindles. Either model will accurately drill or tap an almost unlimited variety of hole patterns. These multiple-spindle heads are shipped ready to attach to any standard drill press through an Ettco-Emrick drilling or tapping faceplate, or they will fit any standard Ettco drilling or tapping unit or machine. The heads are designed to run at top speed in

any operating position in either direction without vibration, regardless of spindle location.

Spindles can be quickly added to or removed from the gear case, making it easy to change the number in use as needed. They can be quickly located anywhere within a 3-inch diameter with a 15/16-inch minimum center distance even while the unit is running. All universal ball joints are lubricated with one-shot lubrication, and both joints and Alemite grease fittings have neoprene covers to keep the lubricant in. Where fixed-spindle operation is desired, aluminum templates, jig-bored to requirement, can be supplied instead of spindle locating arms.

Circle Item 129 on postcard, page 237



Rotary die threader brought out by the Waterbury Farrel Foundry & Machine Co.



Ettco-Emrick Model 600 adjustable multiple-spindle head set up for drilling



## King Boring Mill with Electrical Control and Automatic Feed Stops

A 36-inch vertical boring and turning machine with full electrical control and automatic feed stops has been announced by the American Steel Foundries, King Machine Tool Division, Cincinnati, Ohio. Adjustable stops are provided for vertical and horizontal feed control of all heads. The standard five-position turret head (illustrated), has one vertical adjustable stop for each of the five turret faces, and there are five adjustable stops for the horizontal travel of the saddle. Optional features include: automatic stops; automatic tracing control of heads; automatic cycling; power indexing of turrets; and constant surface cutting speed.

The machine is electrically controlled, with all controls located for maximum convenience of the operator. Horsepower has been greatly increased, with two horsepower ratings for each machine:

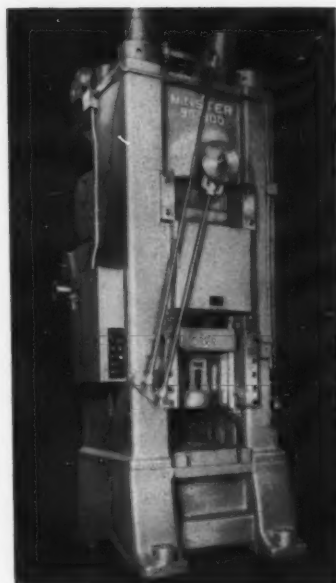
40 and 50 hp on 30-, 36-, and 46-inch sizes; 75 and 100 hp on the 56-inch size and larger.

The expanded feed and speed ranges provide twenty-four feeds from 0.0016 to 0.250 inch per table revolution, and twenty-four speeds in any one of three standard ranges: low, intermediate, or high. Both feed and speed are pre-selective from direct-reading dials. A newly designed spindle and spindle mounting provides maximum table stability and accuracy, and unit construction of the spindle drive permits removal of the drive as a single unit for easy maintenance.

Circle Item 130 on postcard, page 237

## Minster Knuckle-Joint Embossing Presses

A line of Minster Series 90 knuckle-joint presses of improved design covering a capacity range

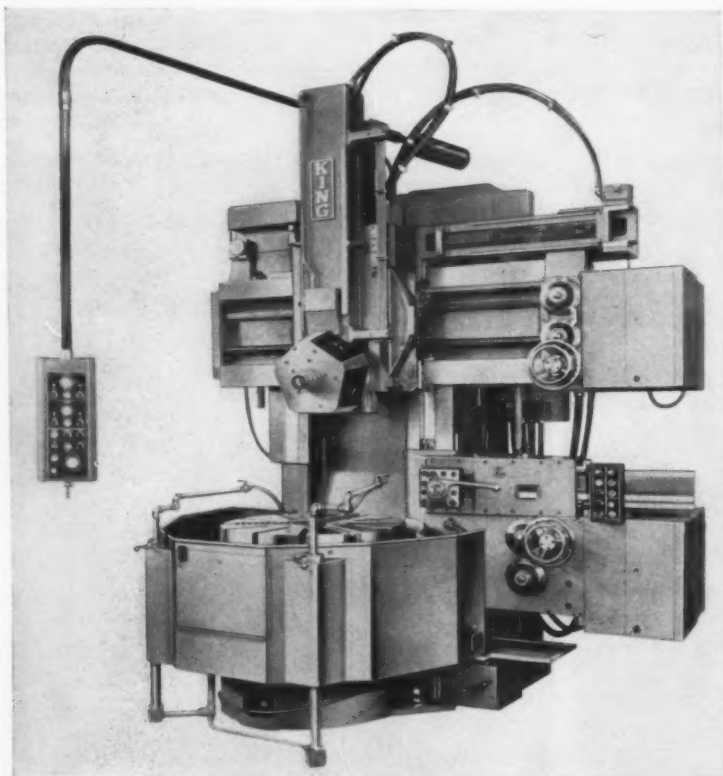


Minster Series 90 knuckle-joint embossing press

of from 150 to 1000 tons has been announced by the Minster Machine Co., Minster, Ohio. The presses in this line are adapted for coining, sizing, and embossing operations at high production rates. The knuckle assembly, adjusting wedge, frame members, slide, and gibs of these presses are precision-built. The Minster patented combination air-friction clutch and brake has been located on the crankshaft within the main drive gear to make higher single cycle efficiency possible.

Higher press speeds, a result of the clutch location, give greater velocity of impact which tends to increase the flow of metal in cavity type dies or when performing sizing operations. The recirculating oil lubrication system, standard on all of these presses, supplies oil under pressure to instantly replenish the oil film on all wearing surfaces after each stroke. An outstanding feature of the improved Minster knuckle-joint press is a standard top-block lock arrangement that prevents a change in slide adjustment which would cause excessive tonnages, machine damage, and parts of incorrect dimensions.

The slide-adjustment wedge is located so that thrust is exerted toward the rear of the machine.



Electrically controlled King boring and turning machine with automatic feed stops

It is dovetailed into and trapped within the confines of the crown. Adjustment of this precision-fitted wedge as well as the top-block lock is made by ratchet wrench, at operator level, through miter gear-shafts.

Circle Item 131 on postcard, page 237

### "Micrac" Fine-Pitch Gear Testing Instrument

An accurate, automatic instrument for checking fine-pitch gears on a production basis has been developed by the Machine & Instrument Division of the Illinois Tool Works, Chicago, Ill. The "Micrac" instrument that does the checking delivers a permanent, visual record of gear quality on straight-line graph paper. Both spur and helical gears can be inspected.

A master worm of extreme accuracy rotates an intimate contact with the work gear. Worms are manufactured integral with a rigid shaft and are hardened

and ground to controlled limits. The single-thread worm makes one complete convolution for each tooth in the production gear. Any error in the master worm, then, repeats in the chart for each tooth and can be easily subtracted. Adequate worm face is provided so that the worm can be re-positioned for long life.

The recording mechanism consists of a sensitive electronic pick-up and amplifier. Simple dial con-

trol provides a broad range of magnification. It is possible to obtain a short chart to check overall gear quality or an elongated chart for analytical checks. The instrument will test gears with a 3/8-inch to 3-inch center distance; 0- to 9-inch distance between head and tailstock centers; and amplification range from 200 to 1 up to 800 to 1; using master worms to 180 diametral pitch.

Circle Item 132 on postcard, page 237

### Reishauer Milling Machine with Automatic Indexing Attachment

A Reishauer Type FA milling machine especially suited for work-pieces that require dividing operations, is being introduced in this country by the Cosa Corporation, New York City. This Swiss-made machine is equipped with an automatic indexing attachment and is universally adjustable. It can mill teeth on end or circumferential surfaces or straight or

helical flutes on cylindrical or tapered tools. Typical work-pieces include milling cutters, cylindrical and tapered reamers, countersinks, ratchet wheels, and index-plates. Several Reishauer FA machines can be run by one operator.

A cross-slide supporting the work-spindle with automatic indexing attachment is mounted on



"Micrac" automatic gear charter announced by Illinois Tool Works



Swiss-made milling machine introduced by the Cosa Corporation

a longitudinal slide and moves at a right angle to it. Maximum longitudinal slide travel is 15 inches with variable stepless feed from 3/4 inch to 8 inches per minute. The work-piece support can be swiveled horizontally to 90 degrees and vertically to 45 degrees. The milling spindle support is adjustable to  $\pm 30$  degrees from its vertical axis and has nine speeds ranging from 63 to 400 rpm. The longitudinal slide, rapid adjustment device, cross-slide clamping, and indexing attachment are electro-hydraulically operated.

By means of the automatic indexing device, working operations, return strokes, dividing movements, etc., all follow each other in predetermined sequence and increments, until the work-piece has made a complete rotation. The indexing attachment, rapid adjustment device, and feed mechanism are so coordinated and interlocked that errors in manipulation are impossible. Precision-ground gears, used as index-plates, can be easily changed and guarantee a high degree of indexing accuracy. The milling machine can be used for either conventional or climb milling on cylindrical or tapered work-pieces.

Circle Item 133 on postcard, page 237

## Mattison Abrasive Belt Grinders

A line of pinch-roll belt grinders for producing good surface finishes while grinding titanium, stainless steel, or carbon steel flat stock to precise gage thickness in a single pass is announced by the Mattison Machine Works, Rockford, Ill. Four machine sizes are available with capacities of 36, 48, 60, and 72 inches. Feed-roll speeds are fully adjustable from 1 to 100 feet per minute.

The belt drive and idling mechanism are designed for belt travel over four rolls arranged in a diamond shape. This arrangement, together with the exceptionally long belt (20 feet 3 inches), provides improved flexing and chip removal and allows the belt to remain cool and free-cutting during long periods of operation. An attachment for spraying coolant or lubricant on either the abrasive belt or work is available. This can be arranged for manual or automatic operation, and for the proper application of the correct lubricant to increase belt life, improve cutting action and prevent burning.

The machine is designed for both polishing and positive stock-removal jobs. Test runs indicate that thickness limits can be held within 0.0015 inch on many jobs.

Photo-electric cell control of the grinding aperture can be provided as an optional feature where final surface finish is particularly important.

Ability to work in either direction is claimed to add materially to the usefulness of the pinch-roll grinder. Both feed- and work-roll design are such that the material can be fed with the rotation of the belt or against it with equal efficiency.

The size of the main drive motor ranges from 50 to 150 hp, depending on machine size. All controls are located at the front of the machine within easy reach of the operator. A load ammeter indicates the amount of grinding load, permitting the operator to determine the point of best work efficiency and to maintain this point by adjusting pressure on the billy roll to proper power consumption.

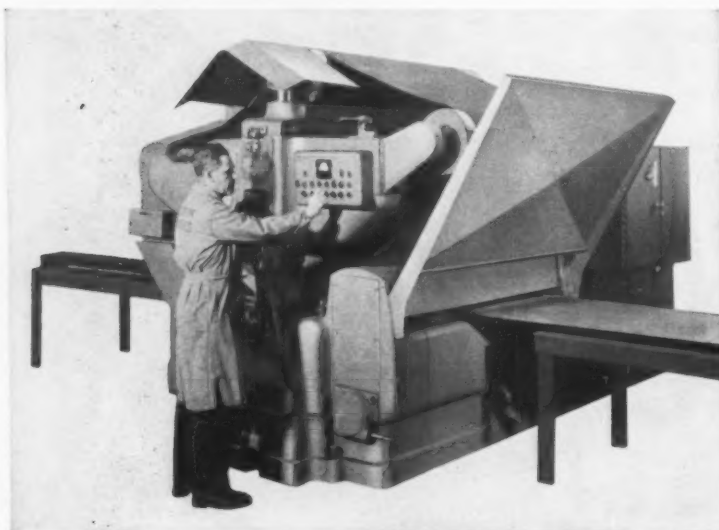
A roll grinding attachment and stand for regrounding the contact roll are available as additional equipment. Since the entire contact roll assembly is removable from the machine, the roll can be reground in its own bearings to obtain maximum smoothness.

Circle Item 134 on postcard, page 237

## Selas Heat-Treating Equipment

Controlled-heat processing equipment for both production line and laboratory will be displayed by the Selas Corporation of America, Dresher, Pa., at the National Metal Show in Chicago this month. Three gas-fired furnaces in actual operation will demonstrate heating for forging, brazing, and high-temperature laboratory work. The automatic, high-speed pusher type furnace shown in the accompanying illustration will be displayed in operation, heating metal slugs. A special window has been built into this furnace, permitting visitors to observe the slugs as they are brought rapidly up to the required temperature.

A newly developed low-cost high-temperature laboratory furnace which reaches 3100 degrees



Abrasive belt grinder for precision finishing and sizing flat stock announced by Mattison Machine Works



Automatic high-speed pusher type furnace introduced by the Selas Corporation of America

F. in only one hour and operates continuously at that temperature using only 200,000 Btu per hour of any available commercial gas premixed with air will also be displayed. This new furnace has a

charge or work space 4 by 4 by 4 inches. The outside diameter is approximately 16 inches and the height 19 1/2 inches, including legs, casing, and cover.

Circle Item 135 on postcard, page 237

### Michigan High-Speed Gear-Hobbing Machine

A high-speed gear-hobbing machine designated Model 1458-B has been developed by the Michigan Tool Co., Detroit, Mich. This versatile, horizontal, single-spindle machine is adapted for use in small shops as well as in automated gear production lines. The entire hobbing cycle is fully automatic with the machine returning to the loading position upon completion of the part. Either conventional or climb hobbing may be used with single- or multiple-thread hobs. Gear washers and gear classifiers can be easily assembled into a production unit with this machine.

"Unitized construction," with all necessary assemblies of the machine mounted on a common surface of the machine base facilitates maintenance and reduces down time. The machine hobs up to 4-pitch spur or helical gears. The maximum center distance—hob arbor to work-spindle—is 8 inches. Maximum cross-feed stroke of hob is 5 inches. Gears with either right- or left-hand helix angles up to 35 degrees can be hobbled.

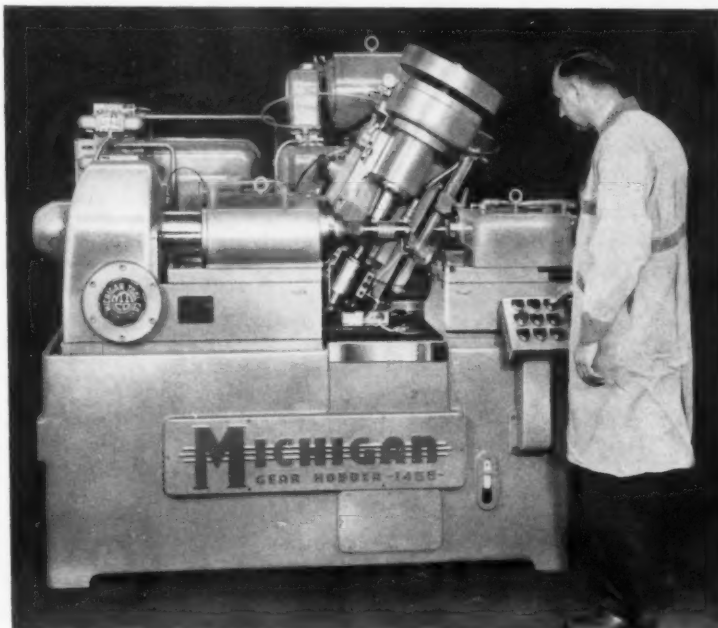
The hob is plunge-fed into the work by a Z-bar mechanism that eliminates the approach feed and thus reduces hobbing time. The

Z-bar can be disengaged for conventional approach feed. The plunge feed is infinitely variable from 0 to 0.800 inch and is hydraulically operated and controlled.

The work-spindle assembly is mounted on a dovetail slide. Two 5-inch hydraulic cylinders, mounted on the same slide, provide ample power for the cross-feed. The heavy-duty spindle mounted on Timken bearings has a recess 23 inches deep for positioning long-shaft gears. The hob spindle, also mounted on Timken bearings, is powered through a minimum number of gears. A fly-wheel on the hob-spindle drive dampens torsional vibration. The hob shifting movement is hydraulically actuated and infinitely adjustable in increments from 0 to 0.100 inch to a maximum of 4 inches.

Coolant is supplied by a centrifugal type pump from a reservoir in the machine base. The hydraulic pumps start the lubrication, hydraulic, and coolant pumps simultaneously to assure proper lubrication to all points before the machine cycle is started. All controls are safety interlocked and circuits are to JIC standards.

Optional equipment includes



High-speed gear-hobbing machine developed by Michigan Tool Co.



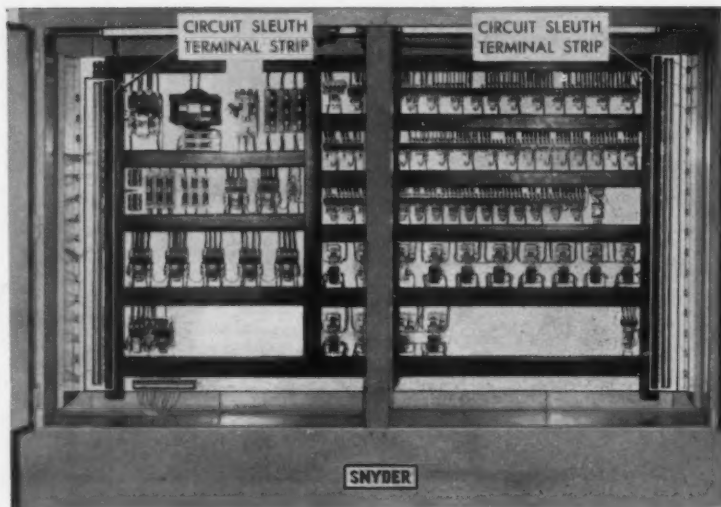
an automatic expansion arbor for work-holding and a size-control mechanism which can be adapted to the Z-bar infeed mechanism. This mechanism works in conjunction with Michigan's automatic three-way gear selector. When the selector signals the machine to make corrections for high or low parts, the size-control mechanism automatically adjusts the Z-bar.

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### Snyder "Circuit Sleuth" Trouble-Shooting System for Control Panels

A simplified, low-cost, compact system that facilitates trouble-shooting of complicated electrical control panels on special automated machine tools has been developed by Snyder Tool & Engineering Co., Detroit, Mich. Called the "Circuit Sleuth" system, it can be applied to electrical control panels on a wide variety of automated machine tools including transfer machines, center-column machines, rotary index machines and trunnion machines.

Basically, the system consists of terminal strips in the control panel to which all internal component connections are wired and special pilot lights in the machine control panel. The system is extremely compact and cuts machine tool control panel trouble-shooting time to a matter of minutes. The terminal strips can be



Control panel for automated machine tools equipped with simplified "Circuit Sleuth" system developed by Snyder Tool & Engineering Co.

readily altered to suit future panel design changes. This system is available as an optional feature

on all Snyder machine tools equipped for automation.

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### Rogers Extra Heavy-Duty Knife Grinder

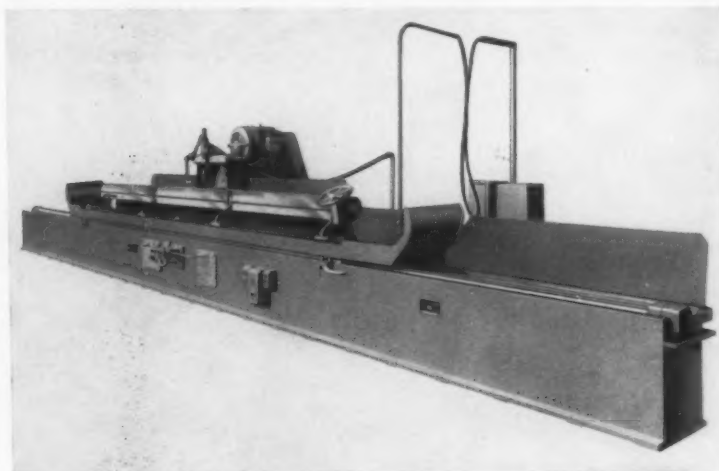
Samuel C. Rogers & Co., Inc., Buffalo, N. Y., has announced a Model 300 extra heavy-duty traveling table type knife grinder. The illustration shows a 240-inch capacity Model 300 grinder equipped with a magnetic knife bar. This model is available in sizes ranging from 78 to 300 inches, with weights ranging from 13,500 to 42,500 pounds.

The chuck-mounted, 26-inch

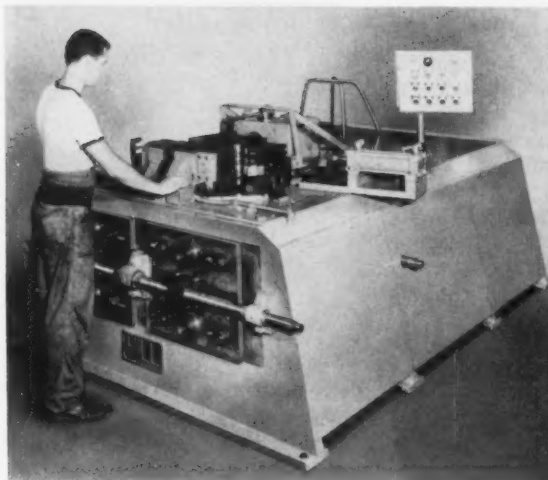
diameter segmental grinding wheel provides cool, rapid cutting action and is belt-driven by a 25-hp (or larger) heavy-duty motor. The grinding-head unit is adjustable to permit concave (hollow) or flat bevel edge grinding. A ball-bearing wheel dresser is mounted on the head. The hydraulic table drive operates at low, variable pressure using two opposing drive-rod type formica-lined cylinders, eliminating use of pistons. Formica bearings also support the drive-rods when extended from the cylinders.

The swiveling knife bar has four finished sides complete with knife or shear mounting slots. The 360-degree swivel range permits grinding to any bevel required. The standard size bar is 8 by 8 inches, but larger sizes, as well as magnetic knife bars, are available. An automatic and adjustable force lubricating system assures even flow of oil to the bed. The wet-grinding system provides adequate flow of coolant. The automatic infeed is adjustable in increments of 0.00025 to 0.003 inch at each end of the table stroke.

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Heavy-duty knife grinder announced by Samuel C. Rogers & Co., Inc.



Hill punch press and multiple bending machine



Kodak contour projector with table equipment

### Hill Combination Punch Press and Multiple Bender

A versatile, fully automated, combination horizontal punch press and multiple bending machine is announced by Walter P. Hill, Inc., Detroit, Mich. This hydraulically powered, high-speed machine utilizes unique press bending principles to simultaneously pierce and countersink holes, flatten, coin weld-projections, and produce multiple bends in two tubular parts at a net production rate of 1440 pieces per hour. Machines of this type are especially adapted for use in the production of tubular furniture, automotive and aircraft molding and trim, and for handling angle, square or rectangular-sectioned shapes.

In the machine illustrated, the operator loads one right-hand and one left-hand straight tubular part into the dies and presses twin safety cycle start-buttons. The hydraulically powered ram advances at high speed under low pressure; simultaneously piercing and countersinking four holes, flattening an area, and coining two weld-projections in each part under high pressure. At the same time, the parts are accurately located and rigidly clamped.

Subsequent operation of twin cams advances wing-die sections, causing the two parts to be bent around die forms to produce three bends in each part. As the three rams retract, the finished parts

fall into an elevating mechanism that transfers them to a conveyor for the next automatic operation. The five-second machine cycle is repeated when the elevating mechanism returns to the loading position.

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### Kodak Contour Projector with Interchangeable Table System

An interchangeable table system for contour projector Model 14-6, recently introduced by the Eastman Kodak Co., Rochester, N. Y., is available from Optical Gaging Products, Inc., Rochester, N. Y. A flat staging table 13 by 19 5/8 inches for production-line optical gaging and a movable work-table for horizontal toolroom measurements, comprise the equipment. The two tables may be purchased separately and can be quickly mounted on the projector as manufacturing conditions dictate. With the flat staging table in place, the projector meets the exacting requirements of on-the-line inspection work.

It is a simple operation to convert the Model 14-6 for limited toolroom measurement work: the movable work-table replaces the flat staging table, making possible rapid horizontal measurement to 0.0002 inch. The slotted 19 1/4-

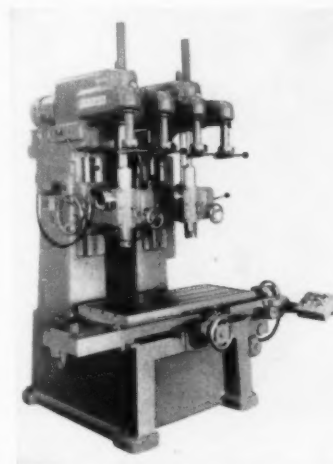
by 8-inch work-table permits use of standard fixtures for simplified staging of a wide variety of parts.

The Kodak contour projector, Model 14-6, is now available with either measuring table or flat staging area or both.

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### Cleereman Two-Spindle Boring and Drilling Machine

A drilling machine with two fixed spindles mounted over a common table and carriage that enables one operator to bore two similar pieces at the same time



Cleereman two-spindle boring and drilling machine

with either the same or different size holes has been brought out by the Cleereman Machine Tool Corporation, Chicago, Ill. Because the table has the same movement under each spindle hole spacing errors are eliminated.

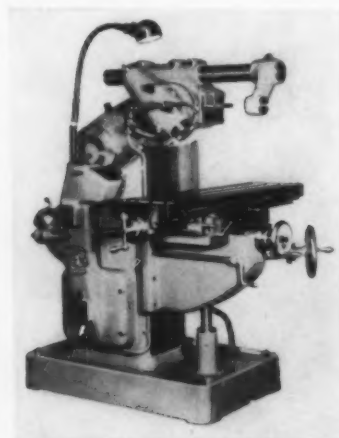
A series of holes located on a straight line can be drilled without jigs on this machine by using a job rod and automatic positioning to control or program longitudinal table movement. Hand traverse positions the table transversely. Automatic positioning in both directions or standard power rapid traverse may be employed as required.

The two-spindle machine has a standard Cleereman upper section mounted on a special base. By using the spindles alternately, accurate boring at wide hole spacing is easily achieved on a comparatively small machine. The spindles are mounted with 26 inches between centers, and the table is 20 by 51 inches with a travel of 15 by 24 inches. This allows a hole spacing of up to 50 inches.

Circle Item 141 on postcard, page 237

### "Abene" Combination Vertical and Horizontal Milling Machine

The Aaron Machinery Co., Inc., New York City, Eastern and Midwest distributor of "Abene" machine tools, is introducing the Model VHF-2B milling machine. This machine has a table 40 by

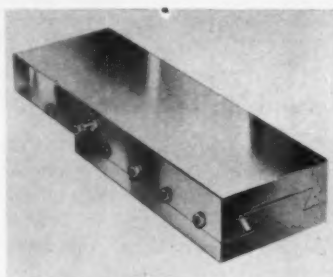


"Abene" milling machine introduced by Aaron Machinery Co., Inc.

10 1/4 inches and twelve spindle speeds ranging from 50 to 1300 rpm. It combines the working scope of both vertical and horizontal millers. The spindle can be placed at an angle of 90 degrees to the longitudinal line of the table, and is adjustable for any angle, from 0 degree in the horizontal plane to 45 degrees past the vertical plane.

The spindle is mounted in adjustable SKF roller bearings. The gears in the gear-box run in oil and have shafts mounted in roller bearings. Standard machines are provided with No. 4 N.S.T. tapers.

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Gilman heavy-duty slide assembly

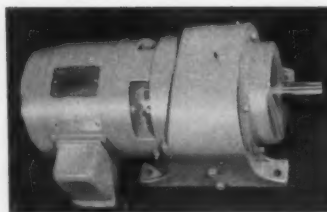
### Gilman Precision Slide Assemblies

Expansion of its line of precision slide assemblies to 132 standard models is announced by Russell T. Gilman, Inc., Grafton, Wis. These stock components are designed to save time and reduce costs in building special machines. The slide assemblies can be supplied in a broad range of types and sizes for varied requirements. Stroke lengths from 3/4 inch to 8 inches are available, with slide working surfaces from 2 by 3 to 8 by 24 inches.

Both light- and heavy-duty models are offered. Sliding surfaces can be furnished either milled or hand-scraped. In addition to the basic slides with male and female members, gib and adjusting screws, there are other types which include control features such as a return spring, micrometer stop, lead-screw, and an air or hydraulic cylinder.

The female member slides on dovetail ways, with clearance regulated by a steel gib.

Circle Item 143 on postcard, page 237



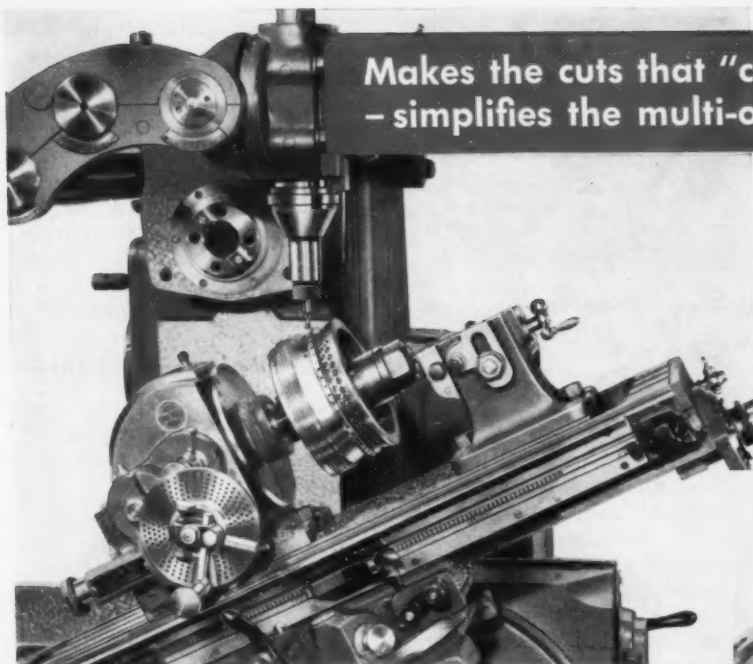
Integral type gear-motor of new line introduced by General Electric Co.

### General Electric Line of Gear-Motors

A new line of integral type gear-motors and related transmissions has been announced by the General Electric Company's Gear Motor and Transmission Components Department, Paterson, N. J. The compact, versatile speed-reduction units in this line will be offered in three basic components: an integral type unit, shown in the illustration, which is functionally equivalent to previous General Electric designs in which gear and drive motor are packaged into a single unit; an all-motor type which features the drive motor coupled to the gear reducer and mounted on a common carrier; and a separate helical speed reducer which may be used with a variety of prime movers.

Mounting dimensions on all three components are identical for similar rating, and parts are interchangeable. Double helical gears, designed to take advantage of the latest advances in gear manufacture, are employed in these units which are compact, flexible in application, and easily maintained or serviced. An important new feature is the built-in provision for accomplishing ratio changes through a change of pinion and gear in the first stage only. This provides for changing demands in production rates without costly investment in additional equipment. Means for removing and replacing the pinion and gear are built into each unit. The flexibility of mounting arrangements covers a broad range of requirements. Gear components can be carried in stock as sub-assemblies, thus minimizing down time for normal repairs.

The line will be offered in three basic types of speed reductions:



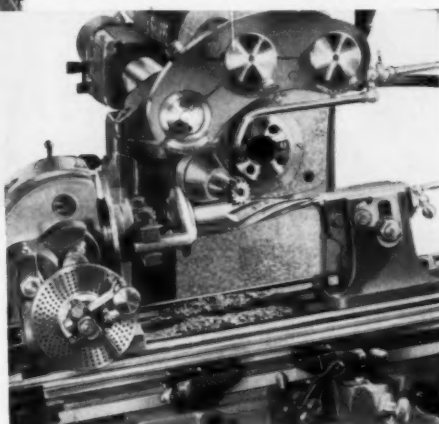
**Makes the cuts that "can't be done"  
—simplifies the multi-operation jobs.**

**MILLING AT VARIOUS ANGLES  
WITHOUT RE-LOCATING WORK**

Three series of evenly-spaced holes are milled in angular and horizontal surfaces, simply by swiveling the knee and positioning table to bring the work piece to the required position. Illustration shows the last row of holes being milled. No change was needed in the location of the work on the table.

**CUTTING SPIRAL TAPER REAMER TEETH**

The OMNIVERSAL *only* offers the required combination of motions and settings for many jobs like this.



**ALL in the day's work  
for the Brown & Sharpe OMNIVERSAL**

The OMNIVERSAL provides the flexibility, work-range, and precision to handle *all* the milling operations called for in multi-operation work, at big savings in set-up time and cost. Get full information . . . write: Brown & Sharpe Mfg. Co., Providence, R. I.

**FOR TOOLROOM  
experimental, and prototype work  
No. 0 OMNIVERSAL Milling Machine**

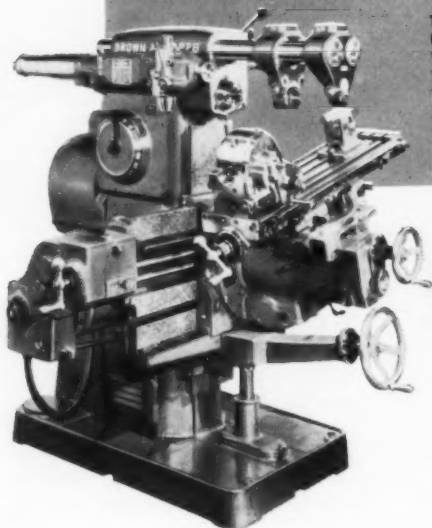
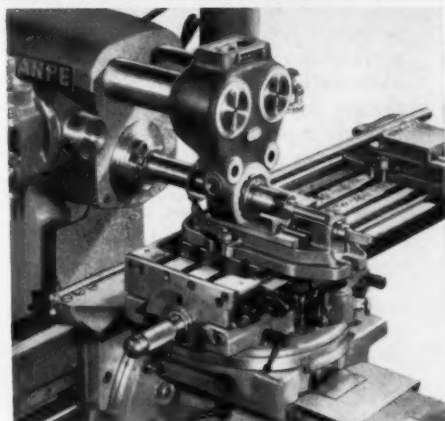


Table feed	17"
Knee slide feed	17"
Total horizontal feed	34"
Transverse feed	5 1/4"
Vertical adjustment	15"
Axial hand feed of Omniversal Milling Head, 2"	



**MILLING KEYWAY FULL 34" LENGTH of shaft.**  
The exceptional longitudinal and vertical range of the OMNIVERSAL is another reason why its versatility is practically unlimited. Cuts up to 34" in length are made by combining feed of knee slide and table.

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MILLING, GRINDING, AND SCREW MACHINES • CUTTERS  
MACHINE TOOL ACCESSORIES • PRECISION TOOLS • PUMPS



single reduction offset shaft in speed ranges from 780 to 350 rpm; double reduction concentric shaft for speeds from 350 to 37 rpm; and triple reduction concentric shaft for output speeds from 30 to 13.5 rpm.

Integral type gear-motors will be available in the new line from 1 to 30 hp. The first ratings, up to 10 hp will be released October 1. The line will be completed through 30 hp by February 1, 1958.

Separate helical speed reducers and all-motor gear-motors will be developed from 1 to 75 hp by July, 1958.

Circle Item 144 on postcard, page 237

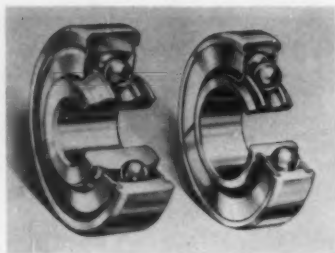
### King-Size Inclined Forcing Press

The Elmes Engineering Division, American Steel Foundries, Cincinnati, Ohio, has built a king-size inclined forcing press of the two-bar type, designed primarily for forcing large wheels and drums on and off shafts. The press is approximately 40 feet long, 15 feet high, and has a pressure capacity of 1000 tons. The opening between the ram and the motorized resistance head is adjustable in increments of 36 inches up to a maximum of 30 feet. The ram is electrically controlled by a push-button with a flexible cord long enough to permit operation of the press from any position over the entire length of the press opening.

Circle Item 145 on postcard, page 237



Elmes king-size inclined forcing press



Norma-Hoffmann bearings for aircraft control systems

### Bearings for Aircraft Control System

The Norma-Hoffmann Bearings Corporation, Stamford, Conn., has announced an expansion of its line of precision bearings designed for use in aircraft control systems. The new bearings, completely sealed and grease-lubricated, have a full row of balls and special raceway curvatures to provide maximum load-carrying capacity. The inner rings extend at both sides so that, when clamped in a yoke, the outer rings will not foul the supports. The bearings are prepacked with an exactly measured amount of wide-temperature range, water-resistant, filtered grease that meets Government specifications.

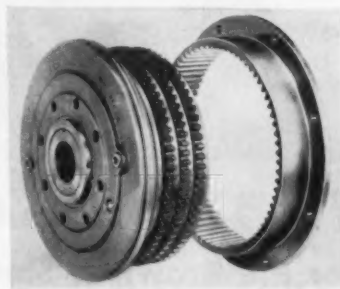
The self-aligning KS series bearings shown at left in the illustration are protected by permanently attached stainless-steel side shields which allow a misalignment of 10 degrees in either direction. The KP and KP-A series,

shown at right, which are not self-aligning, are protected by synthetic oil and grease-resistant seals held in place by stainless steel split washers. Seals can readily be removed for cleaning and regreasing. These bearings are cadmium-plated on all exposed surfaces and conform to Air Force-Navy aeronautical standards.

Circle Item 146 on postcard, page 237

### PO Air-Operated Clutches

Production of 8-, 10-, and 11 1/2-inch size air clutches, as additions to its PO air clutch line,



'PO' air-operated clutch announced by Twin Disc Clutch Co.

has been announced by the Twin Disc Clutch Co., Racine, Wis. The new models are especially suited for machinery and equipment where high torque capacity and long life are essential. They are available in triple-plate, double-plate, and single-plate construction, have a maximum torque capacity of 3503 pound-feet, and operate on air systems of up to 130 psi.

An exclusive feature of these clutches is their cartridge type diaphragm constructed of neoprene reinforced with nylon and so designed that leakage is eliminated. They provide constant torque capacity without adjustment. They are compact and narrow so that they can replace drum or band clutches. Heavy-duty construction provides for long life on high energy loads. These clutches can be used wherever the convenience of remote air control is desired. They are currently in use on rock crushers, tractor winches, pipe-extruding machines, drilling

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# There is a difference in Bushings

## And here's what it means to you . . .

Recent tests in drilling 16,300 holes prove beyond doubt there's a difference in the wearing quality of bushings. Ex-Cell-O Bushings lasted twice as long as all other bushings in the test.

There's a difference, too, in accuracy and uniformity of hardness—brought about by automatic control of furnace temperature, time in the furnace, and quenching technique.

These differences make Ex-Cell-O the leader: (1) High chrome, high carbon oil-hardening bearing steel is used for long wear. (2) This steel is uniformly heat treated to 62-64 Rockwell "C". (3) Bushings are precision ground on inside and outside diameters, and under the head for perfect seating. (4) Besides measuring up to A. S. A. standards, bushings must meet Ex-Cell-O's own standards for precision.

Large inventories in Detroit, New York, Downey, Cal., Lima, Ohio, and London, Canada, keep your inventory down. You get immediate shipment.

Write for an Ex-Cell-O Drill Jig Bushing Catalog today.

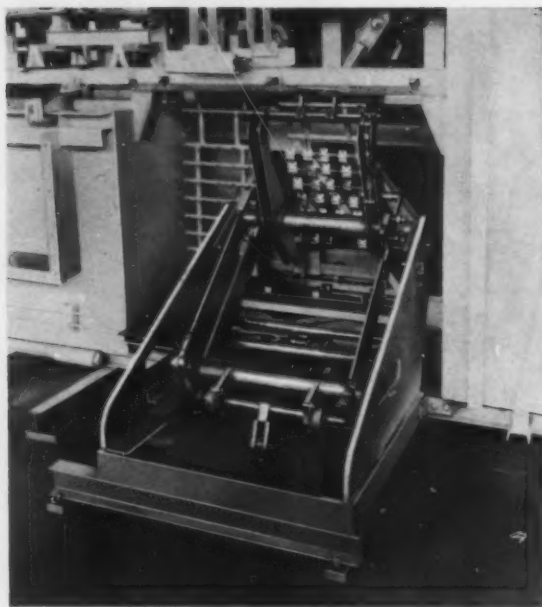


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CORPORATION  
DETROIT 32, MICHIGAN

EX-CELL-O  
FOR  
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RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT



Wagner unloader designed to remove parts from automatic plating machine

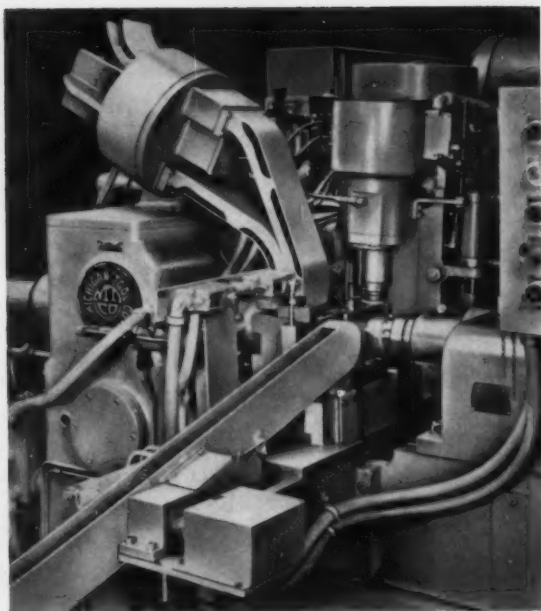


Fig. 1. Michigan hobbing machine equipped with automatic parts feeder

rigs, machine tools, pug mills, and other types of industrial equipment. Addition of the three sizes extends the Twin Disc line of PO air clutches from 8 to 36 inches in diameter, with torque capacities ranging up to 126,600 pound-feet.

Circle Item 147 on postcard, page 237

### Unloader for Automated Machine

A work unloader with an operating movement resembling that of a seesaw, with its arms making a 120-degree arc in rocking back and forth, has been designed especially for use on an automated plating machine by Wagner Bros. Inc., Detroit, Mich. This unit automatically unloads plated parts, actually performing work normally requiring two men. It grasps and removes a rack-load of parts as they come from the plater's drying station and tilts the load forward to deposit the parts onto a moving conveyor belt. The rack is then returned to the machine for its trip to the loading station via the stripping and rinse baths. The unit can be synchronized with any pre-set cycle of the automatic plater. As

a package unit, it can be adapted to most automatic plating equipment now in use.

Circle Item 148 on postcard, page 237

### Automatic "Orientor" for Feeding Parts to Hobbing Machine

An automatic "orientor" developed to feed parts into a hobbing machine in the proper positions for back-to-back hobbing of two parts simultaneously has been added to the line of automated loading and unloading devices built by the Michigan Tool Co., Detroit, Mich. The unit is particularly applicable to gears with extended hubs as shown in Fig. 2, and similar parts which tend to support each other when mounted in pairs on an arbor.

In operation, all parts enter the drum type alternator aligned the same way and are gravity fed into the drum from an overhead distribution system. A positive stop permits only two parts to enter the alternator at a time. Limit switches, actuated by the machine cycle, move spring-loaded pawls which release a swinging arm to rotate one of the two parts 180 degrees. The parts are then in a back-to-back position but on

opposite sides of the drum. Two escapement mechanisms allow each part to slide down its independent track. The tracks merge at the input end of the machine feed slide where the parts drop into a slot in their proper positions to be mechanically shuttled to the arbor of the machine.

Set up as shown in Fig. 1 for the back-to-back hobbing of small pump gears on a Model 1445 Michigan hobber, the parts alternator performs the feeding operation in a loading time of four seconds for two gears.

Circle Item 149 on postcard, page 237

This section continued on page 242.

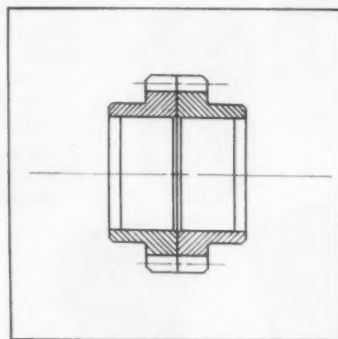
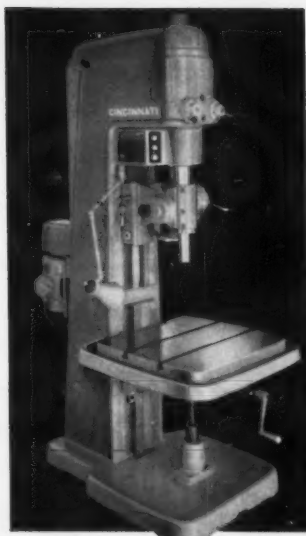


Fig. 2. Typical gears are automatically fed to machine shown in Fig. 1, for back-to-back hobbing



21/25 Heavy Duty Floor Drills in 21" and NEW 25" sizes. Box column, in single and multiple spindles, round column in single spindle only. Standard speed range 75 to 1530 rpm. 1½" drilling capacity.

NOW... **4** sizes to choose from!

# CINCINNATI

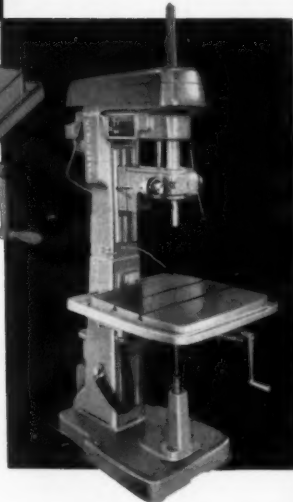
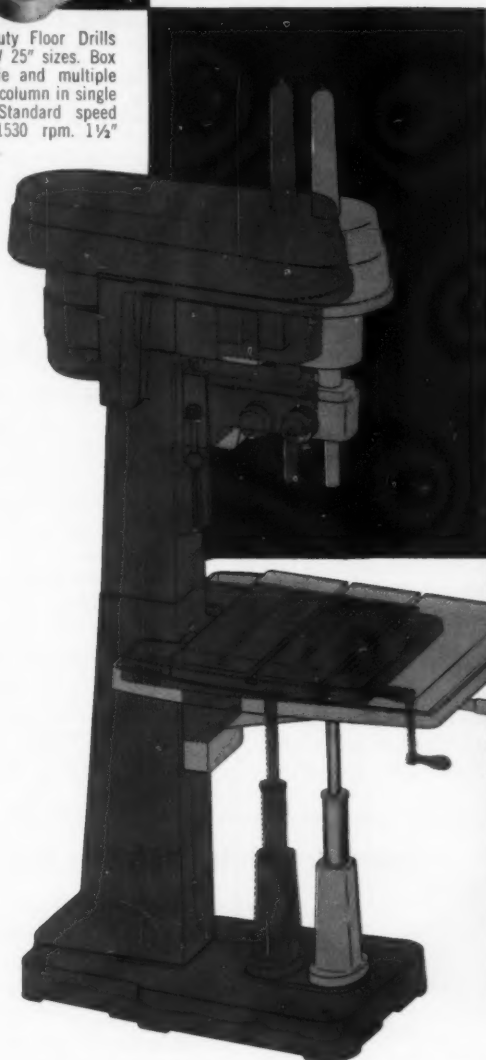
## SLIDING HEAD DRILLS

Greater throat capacity has been added to Cincinnati's industry-proven 16" and 21" Sliding Head Drills . . . the 16/24 Medium Duty Drills are built in both the familiar 16" and the NEW 24" sizes, the 21/25 Heavy Duty models in 21" and 25".

All of the proven features are in all four sizes—geared power feeds, positive stop and automatic feed disengage, sturdy box construction, and many others—giving you the ease of operation, high accuracy and stability of drilling machines that cost far more.

Investigate how you can speed up and improve your drilling operations with these new Cincinnati Sliding Head Drills. See them and get all the facts at your local CL&T Dealer. Or, write direct.

CINCINNATI LATHE AND TOOL CO.,  
3207 Disney St., Cincinnati 9, Ohio.



16/24 Medium Duty Drills in 16" and NEW 24" sizes. Bench and floor models, single and multiple spindle. Standard speed range 390 to 3100 rpm, 1" drilling capacity, 24" size has new larger work table.

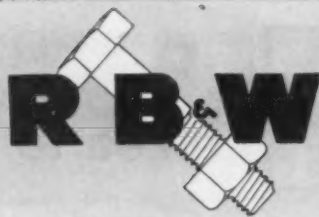


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# FASTENER BRIEFS

RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY



## Technical-ities

By John S. Davey

### Nuts — their use and abuse

With bolts tightened to high load levels, nut performance becomes critical.

A nut produces bolt tension by rotating and advancing on the bolt threads. To do this, there must be a mating condition of threads, which is influenced by thread lead. Lead is a matter of tolerance only before bolt is stressed. When tightened, the nut is then under compression and threads tend to contract; the bolt is in tension, and threads tend to stretch. Lead of thread is affected—elastically before yield point, permanently beyond it.

This shortening of one lead and lengthening of the other has two effects. (1) The load distributes unequally along the threads (2) Torsion on bolt increases. Something has to give. For high tensile bolts especially, it is better for the nut to do so. A nut therefore should be soft enough so that it deforms plastically and compensates for off-lead. If it does, it distributes the load and can advance to increase tension.

#### "SOFT" NUTS DO MOST JOBS

"Soft" nuts do adjust more readily than hard ones under these severe conditions. While such nuts may not be as strong in shear as heat treated ones, the important point is the bolt tension they produce. As long as the nut can pull the bolt well into its plastic range, it is doing more than its share of the job.

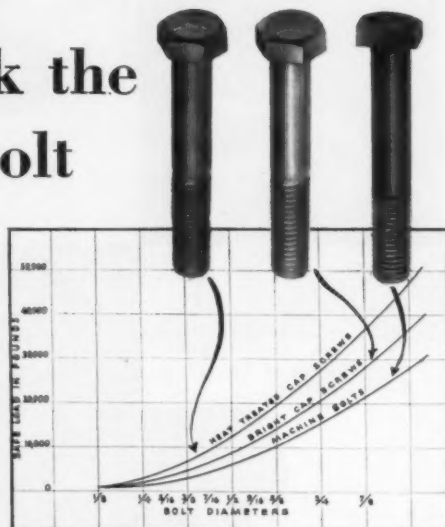
## How to pick the right size bolt

ALMOST all bolt and cap screw strength requirements can be satisfied from three types of standard fasteners without recourse to costly special alloys. In the widely used middle range of sizes, the problem is one of deciding which makes the best joint, or which proves the most economical for the job.

#### MORE FOR LESS

Suppose, for example, you need a bolt safe for 20,000 pounds of loading. As the chart shows, you could use an RB&W  $\frac{7}{8}$ " square-head bolt, a  $\frac{3}{4}$ " bright cap screw, or a  $\frac{5}{8}$ " heat treated one.

If you have a lot of holes to fill, use the larger, lower strength fasteners. But to cut down number of bolts, or their size (and therefore cost), go to the higher tensiles. However you gain nothing if you don't tighten high tensile bolts to their full strength.



When it comes to uniformity of dimension, quality of head and thread, and ease of assembly, all RB&W cold headed fasteners are the same. They differ mainly in tensile strength as shown here.

#### HOW COSTS COMPARE

In terms of holding power: For each \$1.00 in high tensile bolts, it costs \$1.50 to provide equivalent clamping force with bright cap screws; or \$1.65 with machine bolts.

For more suggestions on fastener economy or for copy of above curves, write Russell, Burdsall & Ward Bolt and Nut Company, Port Chester, N.Y.

Plants at: Port Chester, N. Y.; Coraopolis, Pa.; Rock Falls, Ill.; Los Angeles, Calif. Additional sales offices at: Ardmore (Phila.), Pa.; Pittsburgh; Detroit; Chicago; Dallas; San Francisco.

## Spin-Lock Nuts dig in to stay tight



The photograph shows the many hardened "anchors" on the flange of a Spin-Lock Nut. These "ratchet-action" teeth require 20% more torque to loosen than to tighten. They bite in as the nut turns down on its seat. Like Spin-Lock Screws, these nuts can stay put in products subject to vibration and cyclic temperature variations. Send for bulletin.

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## NEW CATALOGUES

**HIGH-TEMPERATURE FASTENERS**—Standard Pressed Steel Co., Jenkintown, Pa. Leaflet describing the company's high-temperature fasteners with unprecedented static tensile and fatigue strengths at temperatures up to 900 degrees F. The tension and shear bolts—called Tm 9 by SPS—have immediate applications in jet-engine and airframe hot spots and in high-temperature, high-pressure equipment in chemical, nuclear, and power-generating industries. The Tm 9 fasteners are 50 per cent stronger than stainless and alloy steel fasteners currently used at these elevated temperatures. They are actually stronger at 900 degrees F. than most high-strength bolts are at room temperature. . . . .1

**DEEP-HOLE DRILLER**—Pratt & Whitney Co., Inc., West Hartford, Conn. Illustrated folder describing the company's 1 1/2 deep-hole driller designed specifically to produce long, straight, true holes accurately in a single continuous operation. This machine is available in six bed lengths to accommodate production requirements for drilling holes up to 2 inches in diameter and up to 129 inches in length. A wide variety of work such as gun barrels, hollow spindles, bridge pins, boring-bars, camshafts, etc., can be handled speedily and economically. . . . .2

**STRAIGHTENERS**—Waterbury Farrell Foundry & Machine Co., Waterbury, Conn. Bulletin 820-T-5, describing the company's line of straighteners for flattening ferrous and non-ferrous coiled strip or sheet. The machines covered are divided into four types: (1) roll feed straighteners with direct pinion drive; (2) spindle-driven roll straighteners; (3) back-tension units used in rolling-mill operations; and (4) special custom-engineered straighteners. . . . .3

**STAINLESS-STEEL FINISHING METHODS**—R. G. Haskins Co., Chicago, Ill. 18-page catalogue describing stainless-steel finishing operations. The correct approach to actual finishing is presented in the order of the severity of the operations themselves. Thus, in this order, are grinding, sanding, the satin finishes obtained by using string wheels, polishing and buffing, along with detailed information on the techniques to be followed by operators, such as pressures, strokes, and speeds. . . . .4

**HEADSTOCK-TAILSTOCK WELDING POSITIONERS**—Aronson Machine Co., Arden, N. Y. 12-page bulletin No. HTS57, featuring eight models of headstock-tailstock welding positioners ranging in capacities from 5000 to 160,000 pounds. Complete information on each model is given plus a page of comprehensive specifications and quality features including precision rotation and positive ground current conduction. . . .5

**AUTOMATIC LOADERS**—Michigan Crane & Conveyor Co., Detroit, Mich. Bulletin describing the company's line of automatic loaders for heat-treating furnaces, plating lines, and continuous tumbling. It is claimed that increases in furnace production up to 100 per cent, practical elimination of rejects from over or under heating, and savings in man-hours up to 80 per cent are achieved with this equipment. . . . .6

**TESTING MACHINES**—Tinius Olsen Testing Machine Co., Willow Grove, Pa. Bulletin 47, describing the company's complete line of Super L hydraulic universal testing machines. Among the features described is the auxiliary pressure-loading system now standard in all Super L machines. This dual-pressure system both applies load to the specimen and lubricates the minute clearance between the piston and cylinder. . . . .7

**STEEL BARS**—LaSalle Steel Co., Hammond, Ind. Wall chart showing all AISI grades of cold-finished steel bars. This 5-page comparison chart lists the 241

grades of steel bars which satisfy more than 95 per cent of all current specifications as well as their complete chemical analysis. Machinability ratings are also given in surface feet per minute or as a percentage rating compared to AISI Grade B1112. . . . .8

**GRINDING WHEELS**—Simonds Worden White Co., Dayton, Ohio. 4-page, two-color bulletin-specification sheet illustrating and describing the complete line of surface grinding wheels manufactured by this company. A wide range of standard types and sizes available from stock are included in a specification table. Custom wheels are also developed for special applications. . . . .9

**LIGHT-HEAVYWEIGHT MACHINE TOOLS**—Walker Turner Division, Rockwell Mfg. Co., Pittsburgh, Pa. 48-page catalogue describing the company's line of light-heavyweight machine tools and accessories. This line includes band saws, circular saws, cut-off machines, drill presses, radial drills, grinders, lathes, a spindle shaper, a scroll saw, a belt and disc surfer, and a jointer. . . . .10

**MILLING MACHINES**—Greaves Machine Tool Co., Cincinnati, Ohio. Illustrated catalogue 119, describing the company's 2-H plain and universal milling machines. Both standard and optional equipment are described. Detailed specifications, including speeds, feeds, table size, rapid traverse speeds, and other facts concerning capacity and operational characteristics are given. . . .11

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**COPPER-NICKEL RESISTANCE ALLOY**—Hoskins Mfg. Co., Detroit, Mich. 8-page illustrated catalogue M-56C-N, describing copper-nickel resistance alloy developed for use on "cold" resistor applications in electronic devices, precision instruments, and similar apparatus where mechanical stability and a known low coefficient of resistance are required. **12**

**CARBIDE TOOLS**—Besly-Welles Corporation, South Beloit, Ill. Catalogue 857, dealing with the selection of the proper carbide tool for each individual job and also showing detailed applications, as well as actual photographs with dimensions of each tool. Included are details of the standard carbide tools, standard carbide blanks, lapped toss-away inserts, and tool-holders. **13**

**RESISTANCE ALLOY**—Hoskins Mfg. Co., Detroit, Mich. Combination catalogue and manual giving metallurgical data and design information on Chromel-A, an 80-20 nickel-chromium resistance alloy, widely used as heating elements in furnaces, industrial heating equipment, ranges, and other high-temperature electrical heating applications. **14**

**PRECISION STRIP**—Penn Precision Products, Inc., Reading, Pa. Product Directory covering beryllium copper, chromium copper, phosphor bronze, nickel silver, brass, stainless and nickel-iron strip rolled to close tolerances and thin gages. Tabular material covers availability, mill limits, applicable specifications, and complete property data. **15**

**CIRCUIT PROTECTIVE DEVICES**—General Electric, Plainville, Conn. Bulletin

GEA-6750, describing the industrial line of molded case circuit breakers in ratings of 15 to 800 amperes. Bulletin GEA-6751, giving detailed information on the company's line of adjustable shaft disconnect switches in 30-, 60-, 100-, and 200-amperes. **16**

**INJECTION MOLDING MACHINES**—Hydraulic Press Mfg. Co., A Division of Koehring Co., Mount Gilead, Ohio. Bulletins 5720 and 5706, describing, respectively, the company's H-P-M 20/28- and 6/8-ounce capacity plastics injection molding machine. Several views of both models point out important, complete specifications and standard and optional equipment are given. **17**

**OPTICAL TOOLING**—Keuffel & Esser Co., Hoboken, N. J. 56-page manual covering the basic principles of optical tooling. Photographs and drawings illustrate the major instruments and accessories used. Optical principles used in applying the equipment are explained. **18**

**VALVES AND CYLINDERS**—Rivett, Inc., Boston, Mass. Folder showing the company's complete line of valves and cylinders. Featured are the popular models in the 1000 standard Rivett line. Cross-sections illustrate and describe each type of air or hydraulic valve and cylinder. **19**

**STAINLESS-STEEL WELDING**—Arcos Corporation, Philadelphia, Pa. 20-page instruction booklet entitled "A Guide to Better Welding of Stainless Steel." Presentation is made in question and answer form, and drawings and close-up photographs clarify both the problems and solutions. **20**

**PRECISION MACHINING TOOL**—Dumore Co., Racine, Wis. Catalogue containing complete details on the company's portable precision machining tool. It includes information on how to use the basic unit and seven attachments for milling, boring, shaping, slotting, grinding, drilling, and other machining operations. **21**

**LIMIT CONTROLLERS**—Daytronic Corporation, Dayton, Ohio. 2-color, 4-page folder describing the company's limit controllers. It describes in detail the use of limit controllers for automatic control of weight, size, force, thickness, pressure, flow, acceleration, stress, strain, and other physical quantities. **22**

**ALLOY**—Haynes Stellite Co., Division of Union Carbide Corporation, Long Island City, N. Y. 24-page booklet containing information on the company's Multimet high-temperature alloy for use at high stresses up to 1500 degrees F. and at moderate stresses up to 2000 degrees F. **23**

**STEEL PIPE AND TUBING**—Tubular Products Division, Babcock & Wilcox Co., Beaver Falls, Pa. Bulletins 145A and 152A, describing the design, construction, and operation of equipment involving the use of the company's Croloy tubing and piping at elevated pressures and temperatures. **24**

**STAINLESS-STEEL FASTENERS**—All-metal Screw Products Co., Inc., Garden City, N. Y. 8-page condensed guide to stainless-steel fasteners. Thirty-seven different types of standard fasteners are illustrated including screws, nuts, bolts, washers, rivets, and fasteners. **25**

**STAINLESS STEELS**—Armco Steel Corporation, Middletown, Ohio. 4-page bulletin describing the properties of 17-4 PH and 17-7 PH stainless steels. Corrosion resistance, high strength, workability, and hardenability at low heat-treating temperatures are some of the points brought out. **26**

**BORING-BARS**—DeVlieg Machine Co., Royal Oak, Mich. 38-page catalogue listing 332 standard general-purpose boring-bars. The company's range of newly designed standard single-tool and two-tool boring-bars, boring-bar sets, and accessories are described. **27**

**DRILL CHUCKS**—Supreme Products Corporation, Chicago, Ill. General catalogue containing specifications of over forty models of drill chucks. Capacity, mountings, and dimensions are shown in tables. Chuck arbors, keys, key holders, adapters, and repair parts are also shown. **28**

**DIE SETS AND BOLSTER PLATES**—E. W. Bliss Co., Die Supply Division, Cleveland, Ohio. 16-page illustrated catalogue describing special die sets and bolster plates. Ordering data and dimensional charts for Dieco all-steel die sets, cast die sets, special die sets, and extra equipment are included. **29**

**WELDING MACHINES**—Sciaky Bros., Inc., Chicago, Ill. Bulletin 324-2R, describing the company's Type SP-1 spot-

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23	24	123	124
25	26	125	126
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29	30	129	130
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**PRECISION TOOLING**—DeVlieg Microbore, Division of DeVlieg Machine Co., Royal Oak, Mich. 36-page, ring-bound catalogue describing the company's Microbore multi-purpose, single-point, adjustable tool for precision boring, turning, and facing operations. . . . . 35

**FLEXIBLE SHAFTS**—S. S. White Industrial Division, New York City. 4-page, two-color bulletin describing the company's line of standard flexible shafts which includes three for remote-control and three for power-drive applications. 36

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tion, New York City. Bulletin concerning the approach to heat transfer and cooling in the process industries. . . . .46

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## PLYA-SEAL WIDE INNER RING BALL BEARING

*Designed expressly for slow speed applications  
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New Fafnir Plya-Seal Wide Inner Ring Ball Bearings are a combination of two outstanding bearing developments. The most effective seal ever devised for retention of grease and protection against contamination, plus the famous Fafnir self-locking collar, for cost-cutting, twist-of-the-wrist bearing installation. This combination of features offers you several advantages . . .

**Best protection yet** against dirt, dust, steam, water, lint, other contaminants on slow to moderate speed applications. Contact-type, Plya-Seals seal out abrasive or corrosive material, seal in factory prepacked lubricant.

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be used. They require virtually no maintenance time or expense. In other applications, where bearings receive hard or constant use, relubricatable types are available. They require only occasional greasing, even under severe conditions.

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BALL BEARINGS



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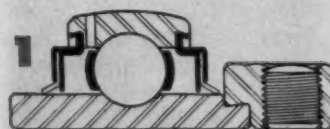


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Write for bulletin containing complete specifications on Fafnir Plya-Seal Wide Inner Ring Ball Bearings and Power Transmission Units. The Fafnir Bearing Company, New Britain, Conn.



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As incorporated in the Fafnir Plya-Seal Wide Inner Ring Ball Bearing, the Fafnir Plya-Seal consists of a synthetic rubber-impregnated fabric sealing washer sandwiched between dished steel plates. Seal flares out, maintaining constant contact with ground outside diameter of inner ring. Years of service have proven Plya-Seals the most effective seal ever developed for ball bearings.



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Pre-assembled stack of Belleville washers make compact "cartridge"

### Compact Energy "Cartridge"

A compact energy "cartridge" consisting of pre-assembled stacks of multiple Belleville spring washers held together by pins or rivets passing through the washers at or near their neutral axis is being offered to product designers and manufacturers by the Associated Spring Corporation, Bristol, Conn. This "cartridge" (of patented design) provides a compact unit which can be incorporated as a one-piece component in a machine. It can be pre-loaded, so that only a slight additional compression force is necessary to assemble the unit in the machine.

A few of the many possible applications for these "cartridges"

are: as a shock-absorber in vibration-isolation mounts for airborne electronic equipment, aircraft, missiles, and ordnance projectiles; in machinery such as impact presses; and in spring mountings for punches and dies in industrial and powdered metal compacting presses; to exert large amounts of force within a limited range of deflection in such products as die springs; to exert force at a low rate—that is, a very small increase in load in proportion to the increase in deflection, such as in clutches for automotive drives, machine tool chucks and spindle drives; and to maintain reasonably constant pressure in spite of expansion due to temperature variations, such as in face type seals for steam pumps.

Circle Item 150 on postcard, page 237

### Coated Abrasive Polishing and Grinding Wheels with Disposable Flanges

Disposable flanges and a design that permits flush sanding are two major improvements in a line of small coated abrasive PG (polishing and grinding) wheels for finishing and maintenance operations, brought out by the Minnesota Mining & Mfg. Co., St. Paul, Minn. These disposable flanges, which lock the coated abrasive leaves securely in place, are factory-installed and bonded to the core. This construction makes it unnecessary to remove

the flanges when a wheel change is required. The new PG wheel is simply slipped on the spindle and the cap-nut tightened. Performance characteristics of the wheel remain unchanged.

Circle Item 151 on postcard, page 237

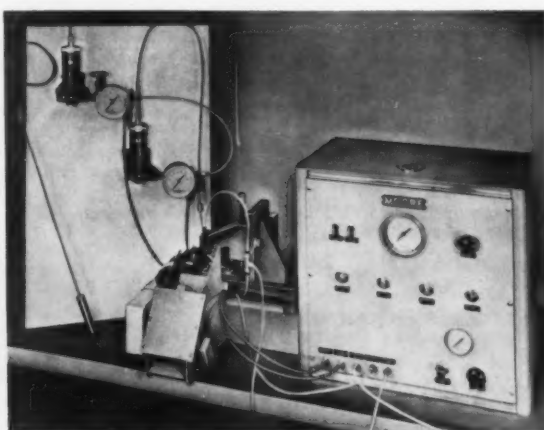
### Moore Machine Tool Automation Control Systems

Moore Products Co., Philadelphia, Pa., has applied two thoroughly tested fluid-process control systems to the automation of a centerless grinder that employs in-process and post-process size-control systems which have inherent individual limitations. The former must contend with grit, coolant, dynamics, and vibration always present during machining; the latter has no such difficulties, but suffers instead from the time lag between machining and gaging. Cascade control, designed to solve both of these problems, uses two gages, interconnected so that the post-gage acts as a monitor for the in-gage. This continuous correction means that compensation for any drift at the in-process pick-up is accomplished automatically by the post-process feed-back signal. The result is much closer size control than can be obtained by employing either in- or post-control alone.

Even with the use of the cascade control, there remains another significant error source in size-control systems—the work-



Polishing and grinding wheel with disposable flanges made by Minnesota Mining & Mfg. Co.



Moore cascade control and temperature compensating equipment applied to centerless grinder

**you'd need  
several machines  
to do all the  
different jobs  
you can produce on  
one BOKOE  
universal miller**



Built-in circular table with power feed and tilting milling head is ideal for bulky work pieces. Also in smaller Model No. 2.

## **No other single machine performs such a variety of operations in one set-up**

It takes several machines to do all that's now possible with just one BOKOE No. 3 Universal Milling and Boring Machine. Because no other machine combines all these versatile features—for non-ferrous, cast iron and alloy steel tooling, patterns and production to close tolerances:

**Large work table and deep throat** handles many jobs in one set-up. Easily accessible for bulky parts up to 8' 2" dia.; distance between column slide and spindle center 37½". Automatic controls on work table provide 28" traverse and 55" longitudinal movement; table feeds infinitely variable from 4" to 39" per min.

**Circular milling** with automatic power feed for circular movement of work table infinitely variable from 7" to 70" per min. (at a diameter of 40"), for continuous rotary milling as well as for radius milling.

**Variable speed changer** with spindle speeds from 36-1800 rpm can be operated without stopping machine.

**Swiveling column turns 180° horizontally in either direction** . . . permits radial drilling in addition to vertical milling, universal milling and boring up to 11½" with large milling slide; six mechanical feeds and rapid travel. Milling head on column swivels vertically 90° in either direction.

**Get to know the big BOKOE No. 3**—how it is doing the work of several machines . . . more economically . . . for such companies as Convair (4); Ford (3); Motor Pattern (7); General Electric, Lockheed, General Motors and hosts of others. **Write for complete details.**



# **KURT ORBAN**

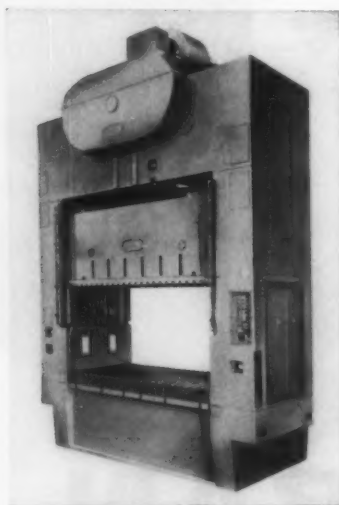
**COMPANY, INC.**

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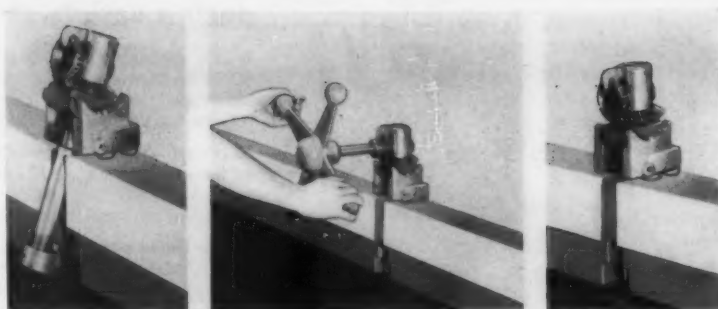


pieces and the gage pick-up are almost never at the same temperature. More significantly, this temperature difference is subject to wide variation during the course of a day. As an example: with a 2-inch diameter, a variation of 20 degrees F. results in a gaging error of 0.00025 inch. To solve this problem, Moore Products Co. has developed a temperature-compensation circuit which corrects the pneumatic-gaging pressure in proportion to the amount of the temperature differential. Two Moore "Nullmatic" thermometers (such as those shown temporarily mounted at the left in the illustration) are used—one measuring the temperature at the post-process gaging head and the other measuring the temperature of a washing bath which is interposed between the machine tool and the gage. (The bath liquid and the work come to a common temperature as the parts pass through the bath.) These thermometers transmit pneumatic signals to a computing relay which also receives the uncompensated gaging pressure. This instrument, called Multi-Function (M/F) relay, compares the two temperature signals and transmits a temperature-compensated gaging pressure signal. Both of these new concepts are incorporated into the Moore centerless-grinder control.

Circle Item 152 on postcard, page 237



Cleveland four-point eccentric press



Views illustrating application and use of punch clamps introduced by the Clearing Machine Corporation

### Clearing Punch Clamp for Mounting Punch Dies on Press Slides

The Clearing Machine Corporation, Chicago, Ill., has introduced a device for mounting punch dies on press slides. These punch clamps can be installed on almost any press. They are permanently attached to the press slide and reduce die mounting time to seconds.

With the T-bolt of each unit pivoted outward, as shown at the left in the accompanying illustration, the slide and punch die are brought together. The T-bolt is then pushed into a pocket provided on the die, and the wheel wrench is inserted and turned in the manner indicated in the central view. When each punch clamp has been tightened and the wheel wrench removed, (see view at right) the press is ready to run.

Circle Item 153 on postcard, page 237

### Cleveland 500-Ton Press

A 500-ton four-point eccentric press designed to produce a wide variety of automotive stampings has been built by the Cleveland Punch & Shear Works Co., Cleveland, Ohio. This press is equipped with a patented, air-operated, electrically controlled drum type clutch. It has a 24-inch stroke, 15-inch adjustment and a shut-height of 61 1/2 inches. Both bed and slide have a die area 72 by 144 inches.

The basic design of this press is said to be extremely flexible. By modifying various dimensions such as stroke, slide adjustment,

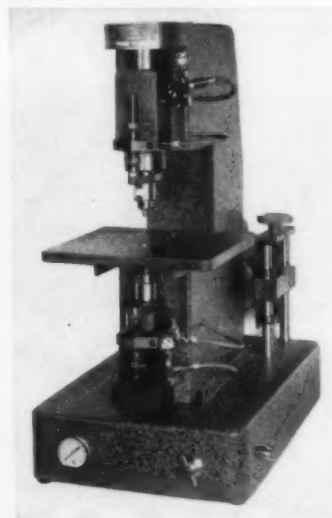
bed, and slide areas, the four-point press can be made available for stamping metal of almost any thickness from light sheet to heavy plate. It is built to JIC standards, and all gears and drive mechanism are completely enclosed.

All gears are spray-lubricated, and the pneumatic cushions in the bed have separate operating controls that permit a wide variety of press operations. The slides are air counterbalanced, and there is a stroke indicator.

Circle Item 154 on postcard, page 237

### Vertical Deburring Machine

Holes drilled through flat and thin sections can be deburred at both ends by alternating spindles on the vertical deburring ma-

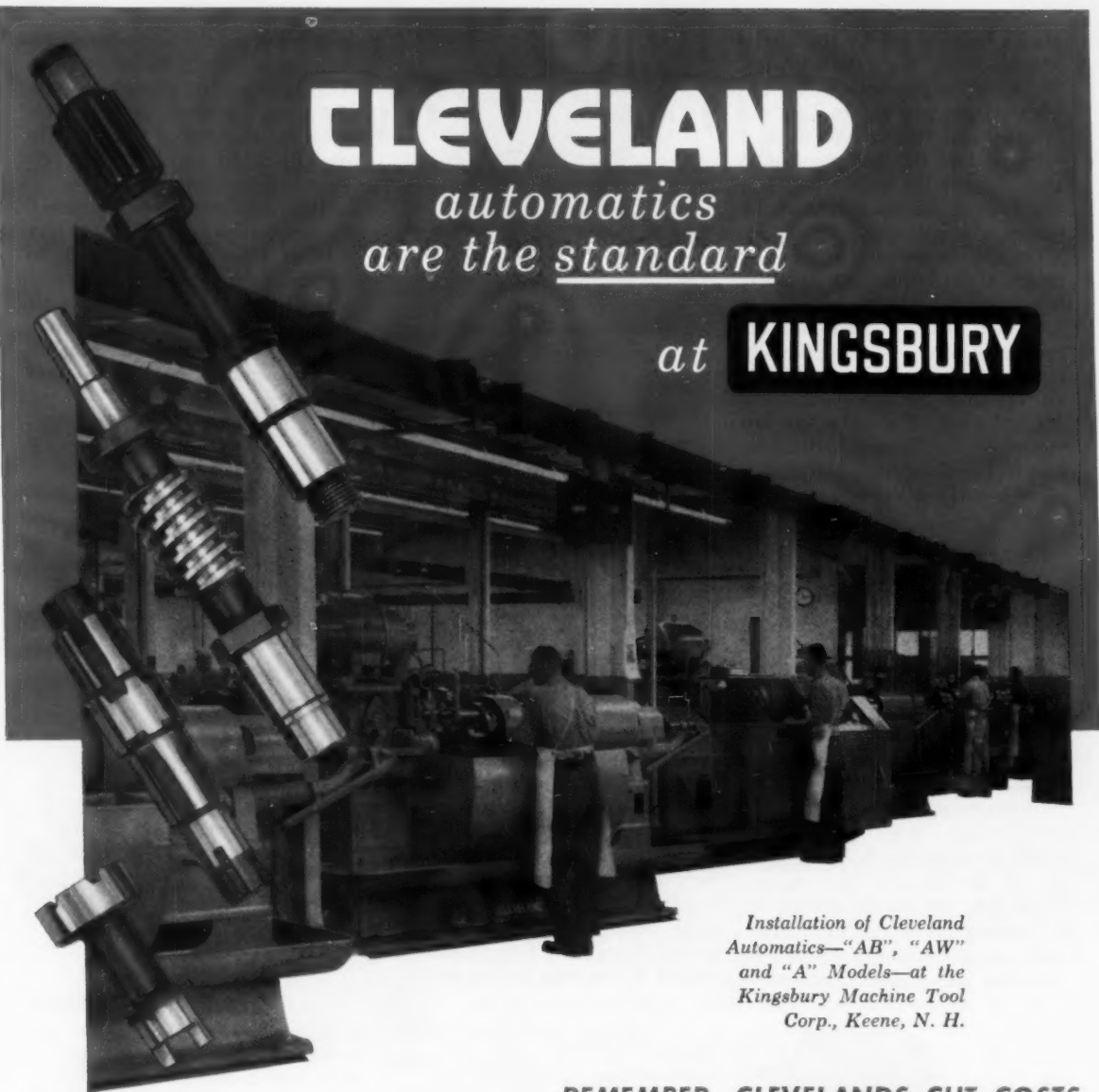


Deburring machine made by Model Machine Co., Inc.

# CLEVELAND

*automatics  
are the standard*

*at* **KINGSBURY**



*Installation of Cleveland  
Automatics—"AB", "AW"  
and "A" Models—at the  
Kingsbury Machine Tool  
Corp., Keene, N. H.*

## REMEMBER, CLEVELANDS CUT COSTS

The Kingsbury Machine Tool Corp., Keene, N. H., has *standardized* on Cleveland Single Spindle Automatics for their screw machine department. The Clevelands are used to blank out many of the component parts for the high production indexing automatic drilling and tapping machines which they build. Shown above are four finished parts which were originally blanked on Clevelands. Many other parts are machined complete on Clevelands.

Clevelands were selected for this work because they combine a wide range of multiple-tooled oper-

ations with quick set-up and easy control. These Cleveland qualities assure fast, accurate and low-cost production on both long and short runs.

If you produce any parts requiring turning, forming and end-working operations, you'll profit by giving Clevelands a full investigation. Call in a Cleveland sales engineer . . . or let us submit recommendations with production and cost estimates based on part samples or prints of your work. There is no obligation. For machine specifications, write for new General Bulletin describing the line of Clevelands.

## THE CLEVELAND AUTOMATIC MACHINE COMPANY

Manufacturers of a Complete Line of Single Spindle Automatic Screw Machines and High Pressure Hydraulic Die Casting Machines

For more information fill in page number on Inquiry Card, on page 237

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MACHINERY, October, 1957—245

chines brought out by the Model Machine Co., Inc., Philadelphia, Pa. After the top spindle has finished deburring the end of the hole on one side of the work it retracts, and the bottom spindle then deburrs the opposite end of the hole on the other side of the piece.

On thicker sections a switch is provided to bring both spindles together at the same time. Holes 1/32 inch to 1/2 inch in diameter can be deburred in exceptionally fast time on this machine, which is air-operated through double-acting cylinders. The cylinders are foot-controlled, leaving both hands free to handle work.

Circle Item 155 on postcard, page 237

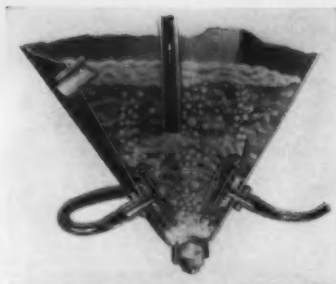
### Ekstrom, Carlson Router

A two-hand router has been placed on the market by Ekstrom, Carlson & Co., Rockford, Ill. This Model HR2-2hp Hi-Cycle portable router operates at a speed of 14,400 rpm. It is provided with micrometer-adjusted depth control and plexiglass safety eye-shield. The illustration shows the operator routing pockets on an aircraft-wing slug. The on-off switch is conveniently located on top of the handle. The taper-milled chip slot on the bottom of the router prevents the chips from piling up while tool is operating.

Circle Item 156 on postcard, page 237



Hi-Cycle portable router made by Ekstrom, Carlson & Co.



Pangborn Hydro-Finish cleaning unit equipped with Sluriator

### Pangborn "Sluriator" Kit

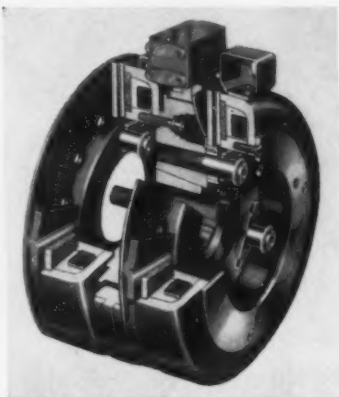
Keeping fine abrasives thoroughly slurred in water for die and mold cleaning, deburring, maintenance cleaning, and other finishing operations has been simplified by the use of a "Sluriator" kit brought out by the Pangborn Corporation, Hagerstown, Md. Designed to prevent the solid packing of abrasive at the bottom of the tank after overnight shutdown, the Sluriator eliminates the need for a mechanical pump and auxiliary equipment and can be adapted to conical-bottom tanks by means of a conversion kit.

The Sluriator consists of a 4-inch diameter compressed air distributor set between two heavy-gage wear-resist alloy circular plates. Two such fittings are installed at the base of the sloping

side walls of the abrasive slurry tank, as shown in the illustration. The agitating air strongly sweeps the tank bottom and spirals through the body of the liquid to provide rapid and thorough agitation of the slurry.

The only equipment required to supply the new Sluriator is a take-off from the regular 80- to 90-pound compressed air line and a needle valve to regulate the air flow through the Sluriator heads at 6 to 10 cubic feet per minute.

Circle Item 157 on postcard, page 237



"Dyna-torQ" clutch made by Dyna-matic Division, Eaton Mfg. Co.

### "Dyna-torQ" Electro-Magnetically Operated Brakes and Clutches

The Dynamatic Division, Eaton Mfg. Co., Kenosha, Wis., has introduced a line of friction industrial brakes and clutches known as the Eaton "Dyna-torQ". These clutches and brakes operate on the principle of electro-magnetic engagement of two friction members (the armature and the field magnet) to develop driving or braking torque. Five models—ranging from 5 5/8 to 16 inches in diameter—are available with static torque ratings ranging from 40 to 700 pound feet.

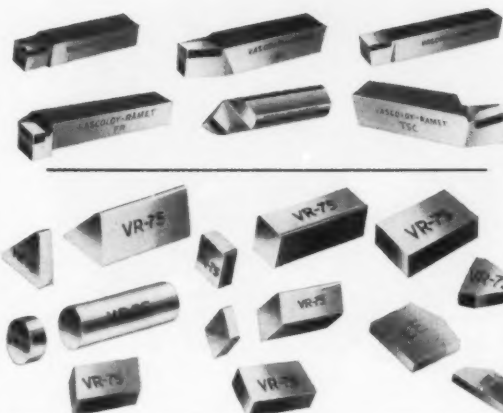
Advantages claimed for these clutches and brakes include: simplicity of controls and provision for remote mounting of controls to conserve space on the processing equipment; extremely rapid response in clutching and braking; smooth engagement of the

(Continued on page 249)

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## V-R OFFERS BOTH

### V-R CEMENTED CARBIDES



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When multiple operations are performed on a single machine, surface speeds of the various operations may vary appreciably. Thus, to secure the optimum of production, tool life and finish, cutting tools of different materials may be required. V-R Tantung Cast Alloy is the answer on operations involving surface speeds too low for efficient use of carbides.

Tantung bridges the gap between the maximum speeds possible with HSS and the minimum speeds practical with cemented carbides. On 1020 steel, for example, the general Tantung cutting range is between 80 and 200 SFPM, whereas carbide is generally used at speeds in excess of 200 SFPM.

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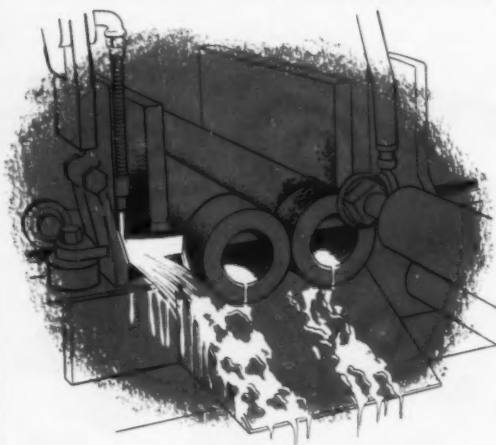
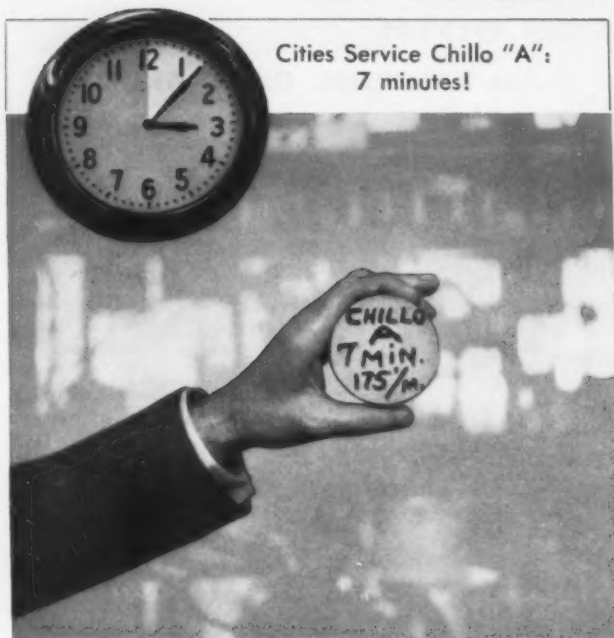
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at S. G. Frantz Co., Inc., Trenton, N. J.



S. G. Frantz Company decided to keep a truly open mind.

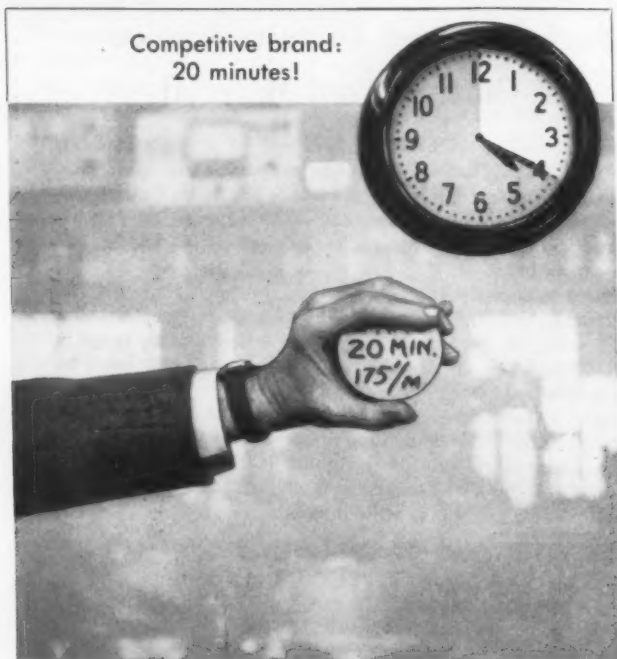
They'd been using Cities Service Chillo Cutting Oil and other Cities Service products for some time with great satisfaction. Still, there was no harm testing Chillo Cutting Oil against another brand just to make sure they were getting maximum results.

But even the people at S. G. Frantz never expected what followed. Using the competitive oil, and a piece of 4130 aircraft rod, 2 7/8" in diameter, they made a single cut at saw speed of 175 feet per minute. Time: 20 minutes.

Next, the same test again — but this time with Cities Service Chillo "A" Cutting Oil. Time: 7 minutes! Nearly three times faster!

Using the same material on another job, the Frantz Company found difficulty making clean threads to aircraft standards on a Number 5 Turret Lathe—that is, until Cities Service Chillo 10Z was tried. Right there the problem ended.

"The problem ended." You'll hear it again and again from those who use Cities Service Cutting Oils and lubricants. And perhaps these oils can end a problem for you, too. Talk with a Cities Service Representative. Or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.



**CITIES  SERVICE**  
QUALITY PETROLEUM PRODUCTS

"Dyna-torQ" members; highly effective cooling; automatic adjustment; and low up-keep cost.

Four types now in production include the basic clutch, the basic brake, the clutch-brake and the clutch-coupling—all available in a wide range of capacities. Corresponding parts of all units in a given size are completely interchangeable. The brakes and clutches are especially suited for use in the field of automation and have applications in machine tools, materials-handling equipment, packaging machines and paper processing equipment.

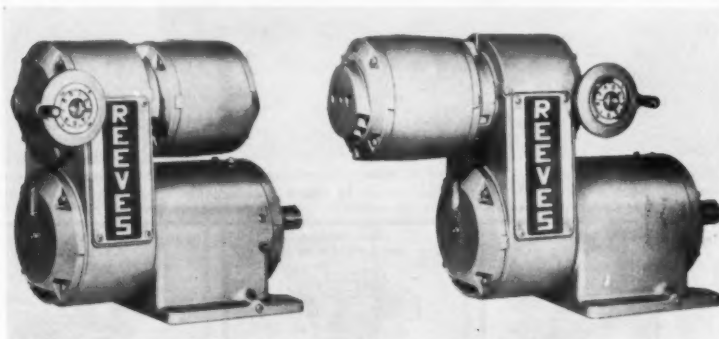
Circle Item 158 on postcard, page 237

### Reeves Vari-Speed Motodrives

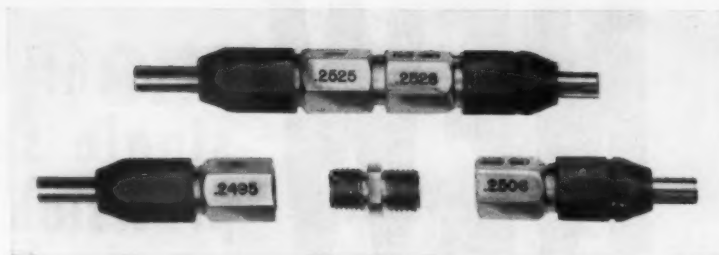
Two new sizes have been added to the line of Reeves Vari-Speed Motodrives made by the Reeves Pulley Co., Division of Reliance Electric & Engineering Co., Columbus, Ind. Improved performance, compactness and assembly flexibility are features of these 200- and 300-size Motodrives for power applications from 1 through 5 hp.

Motor drives in a wide range of compact combinations can be assembled from standard components in "C" flow and "Z" flow styles to fit wide variations in size, shape, and orientation of space requirements. The "C" flow style is shown at the left in the illustration and the "Z" flow, at the right. The complete Vari-Speed Motodrive line covers variable speed control requirements from 1/4 through 40 hp.

Circle Item 159 on postcard, page 237



Two styles of new Reeves Vari-Speed Motodrives.



VK Duplex plug-gage handles brought out by the Van Keuren Co.

### Duplex Plug-Gage Handle

"Go" and "Not Go" ends of wire type plug gages for any double-end combination can be assembled in a matter of seconds by means of the VK Duplex handle brought out by the Van Keuren Co., Watertown, Mass. This modified A.G.D. handle makes possible the maximum control and flexibility of stocked gages as requirements change. The members are locked in marked handle units for use as single-end gages or combined for double-end use. The need for duplication of sizes is thus reduced to a minimum.

With these gages there is never any doubt as to gage identification since each end is marked and colored green or red.

Circle Item 160 on postcard, page 237

### Liquid-Cooled Precision Spindles

The Standard Electrical Tool Co., Cincinnati, Ohio, is manufacturing a line of versatile motorized spindles with spiral-flow design housings that enclose the motor parts and provide for liquid cooling. This design is applicable

to 60-cycle or high-frequency motorized spindles.

The custom-built spindle shown in the upper view of the illustration is typical of units built to minimum dimension and weight specifications. This 10-hp, 360-cycle motorized spindle has a



Liquid-cooled precision spindles made by Standard Electrical Tool Co.

motor diameter of 8 inches, a length of 9 1/2 inches, and weighs 130 pounds. It operates at a speed of 21,600 rpm and is designed for vertical mounting with the 9-inch diameter by 8 1/2-inch long spindle housing submerged in a tank having a temperature of 450 degrees F.

The cut-away view shows the internal spiral-channel design for continuous and uninterrupted flow of liquid coolant as recommended for liquid-cooled spindles such as the heavy-duty, motorized milling type shown in the lower view. This spindle is typical of those produced by the manufacturer in sizes from 10 to 100 hp, single or dual speed. N.M.T.B. spindle nose is standard equipment. The lower illustration also shows the built-in electric brake and conduit box.

Circle Item 161 on postcard, page 237

# NEW

## Frauenthal 1200 Series single spindle vertical precision grinders



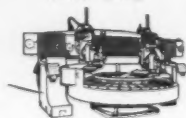
Bird's-eye view of a new Frauenthal 1200 Series (belt-driven) single spindle, vertical precision grinder. These versatile machines are

designed to meet a broad range of present requirements . . . are readily adaptable to future requirements.

# F

**PRECISION  
PRODUCTION  
VERSATILITY**

2200 Series  
72-150" Swing



1800 Series  
60-72-84" Swing

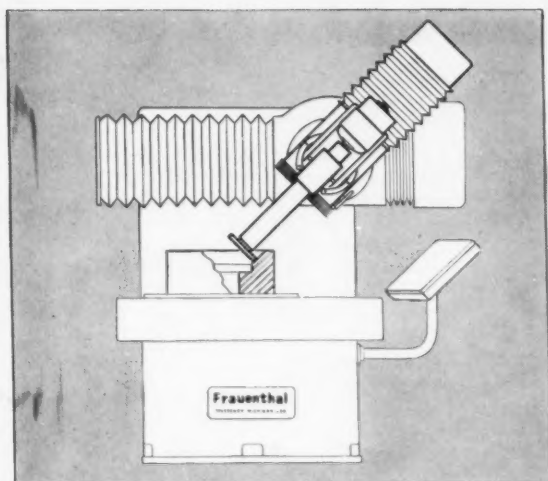


3100 Series  
60-72-84" Swing

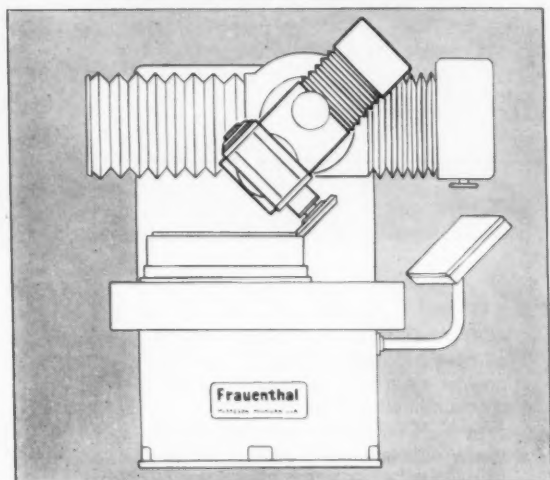


# creatively engineered

... accuracy to .000100" at spindle nose



Frauenthal belt-driven Model 1224B and 1236B single spindle, vertical precision grinders have an extreme angle setting of compound at 45°. Versatility such as this permits angle, internal, external and face grinding to millionths-of-an-inch related tolerances.



Frauenthal direct-connected Models 1224D and 1236D are ideal for rotary surface grinding, O.D. surface and angular approach grinding operations. A variety of grinding spindle positions is possible with this head arrangement.

**assures uniform,  
super-precision  
part after part!**

*Super-precision* is the natural result of overall Frauenthal single spindle, vertical precision grinder rigidity; of proven performance . . . and *continuous* application of advanced grinding techniques.

These new Frauenthal 1200 Series machines are available with choice of belt-driven or direct-connected grinding spindles. Machines with either spindle arrangement are offered with 24" dia. tables x 36" swing and 36" dia. tables x 48" swing capacities inside splash guards. Additional swing can be obtained by removing guards.

Write for free  
Bulletin



1200 Series  
36-48" Swing

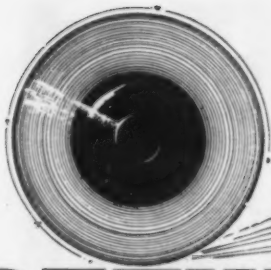


Special Grinding  
Machines using  
standard Slide Units



**Frauenthal** Division  
THE KAYDON ENGINEERING CORP.  
MUSKEGON, MICHIGAN, U. S. A.





By E. S. Salichs

# BETWEEN GRINDS

## Slow Down, Buzzie

The safety buzzer on Buicks, a handy speedometer device which may be set at any predetermined speed and buzzes stridently when the speed is reached, has the makings of a conversation-piece. For example, the chief engineer at Buick, Vern Mathews, tells this story on himself. Stopped for speeding, Mr. Mathews indignantly pointed out to the police officer that he could not have been speeding or his safety buzzer would have warned him, "That's right," agreed the officer, "but the limit here is 35 and you've got it set for 65." Another story involves a company executive who was explaining to a friend how the safety buzzer warned of excessive speed. "There's nothing new about that," his friend countered. "I've had one of those ever since I married her twenty years ago."

## Word Has It

That the dictionary is the only place where success comes before work.

## Warden Out? Oh, the Coffee Break

Salesmen for the Van Dorn Iron Works (a concern building jails) travel with models of two- and three-cell jail installations hooked to the back of their cars, according to **Steelways**. They call on penal institutions and explain how their samples work—and how prisoners can't work their samples. For example, special tool-resistant inserts are incorporated in cell steel during the manufacturing state; walls are made of alternating layers of soft and hard steel; and cell doors lock in three places.

## Bring Your Blocks

The DoALL Co. has instituted a four-day course, "How to Be Your Own Bureau of Standards," in which the student learns to calibrate a set of gage-blocks that he brings from his own plant. Classes are limited to four individuals at a time, and the course ends with the presentation of a "Master Gage Technician" certificate to the students.

## No Mystery to This Midas Touch

An area of 50 to 60 square feet can be covered with 22-carat gold for \$17 with a new heat-treatment method developed by the Hanovia Chemical & Mfg. Co. The coating can be applied on ceramics, porcelain enamel, and stainless steel.



**ROD AND ROLL**—To demonstrate the all-position capabilities of a new iron powder electrode, the A. O. Smith Corporation hired professional contortionist John Ak to perform at the recent American Welding Society convention. Mr. Ak, with only three days of welding instruction, donned a green sequin frog-like suit, and obligingly twisted himself into numerous positions, one of which is here shown, while welding

**XLO** EX-CELL-O FOR  
PRECISION

STYLE 22 QUILL-TYPE  
HYDRAULIC POWER UNIT\*



STYLE 28-A HY-  
DRAULIC POWER  
UNIT



IMMEDIATE  
DELIVERY



STYLE 20 HYDRAULIC  
POWER UNIT

## Specify Ex-Cell-O standard power units and cut your machine tool lead time

Today's demand for increased productivity, lower per-unit cost, even on relatively short runs, is being met economically by automatic, single-purpose, high-production machines—consisting essentially of a plain base and one or more Ex-Cell-O Quill-Type Hydraulic Power Units. Their flexibility allows them to be used over and over again, spreading their initial cost over many productive years.

These standard, self-contained Ex-Cell-O Hydraulic Power Units are now being used for: drilling, counter-boring, spot facing, reaming, as well as prime movers for milling equipment. With multiple spindle head attached to quill flange, multiple operations may also be performed.

For the full story on the cost-saving advantages

Ex-Cell-O Self-Contained Power Units offer your short-or-medium-run production requirements—get in touch with your local Ex-Cell-O Representative. Or, if you prefer, write direct to Ex-Cell-O, Detroit.

\*Style 22—8-inch Stroke; Style 22-L—12-inch Stroke

**EX-CELL-O**  
CORPORATION  
DETROIT 32, MICHIGAN

*Machinery  
Division*

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING AND BORING SPINDLES •  
CUTTING TOOLS • TORQUE ACTUATORS • RAILROAD PINS AND BUSHINGS • DRILL JIG  
BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

# News OF THE INDUSTRY

## California

BERNARD C. DUNN, sales supervisor for milling machines at the Axelson Mfg. Co., Los Angeles, Calif., has been assigned additional duties as sales engineer for lathes in an area starting in the center of Los Angeles and extending to Santa Barbara and Bakersfield.

WHITNEY COLLINS, formerly associated with the Continental Aviation & Engineering Corporation, has joined Solar Aircraft Co., San Diego, Calif., as executive assistant to the president.

K. A. LANG has been made general manager of the Lindberg Engineering Co.'s manufacturing plant in Downey, Calif.

## Illinois and Missouri

ALLEN E. HERMANSON has been appointed manager of Sundstrand Machine Tool Co.'s Machine Tool Divisions in Belvidere and Rockford, Ill. Mr. Hermanson was formerly assistant manager of the Machine Tool Divisions. He joined Sundstrand in the sales and management training program and has worked in various departments of the shop and offices. Upon completion of this program, he served in sales engineering, cutter



Allen E. Hermanson, manager of Machine Tool Divisions, Sundstrand Machine Tool Co.

engineering, and the subcontract departments. He next became a service engineer and advanced to service control manager, a position he held until he became assistant manager.

D. A. STUART OIL Co., LTD., Chicago, Ill., announces the following elections made at the recent stock-



Lester B. Perkins, president, D. A. Stuart Oil Co., Ltd.

holders meeting held in Toronto: LESTER B. PERKINS, president; ROBERT A. BRYCE, chairman of the board; JOHN D. BRYCE, executive vice-president; JAMES P. TOMLINSON and FRED J. SCHMITT, vice-presidents; and F. O. REED, treasurer and assistant secretary. Mr. Bryce previously was the chairman of the board and president.

ROBERT A. BROWN has been appointed to the newly created position of vice-president and general sales manager of Borg-Warner International Corporation, the export marketing and licensing division of Borg-Warner Corporation, Chicago, Ill.

PARKER RUST PROOF Co., Detroit, Mich., announces the opening of a new plant at the Lindbergh-Warson Industrial Center, St. Louis, Mo.

RONALD P. GAJDOS, who formerly managed the company's New Jersey plant, will be manager, and CARL W. MOORE, Southwestern regional sales manager.

NIAGARA MACHINE & TOOL WORKS, Buffalo, N. Y., announce the appointment of BLACHMAN & NEUTZEL MACHINERY Co., 3713 Washington Blvd., St. Louis, Mo., as distributor in Arkansas and all of Kansas except for the southernmost counties.

## Michigan and Indiana

Colonial Broach & Machine Co., Detroit, Mich., announces that ROBERT N. KENDALL is moving to Milwaukee, Wis., to take direct charge for the company in that area, formerly handled by manufacturing agents. D. J. BOND, for many years Detroit district manager of the Lapointe Machine Tool Co., has resigned to become sales representative of the Special Products Division of Colonial Broach.

KENNETH P. MARTIN has been appointed vice-president and general manager of LeMaire Tool & Mfg. Co., Dearborn, Mich. Before joining the company, Mr. Martin was vice-president of National Machine Tool Co., Richmond, Ind., for three years. Prior to that time, he served as sales manager of the Special Machinery Division, Cincinnati Milling Machine Co., as well as in other executive posts in the machine tool industries. (This section continued on page 260)



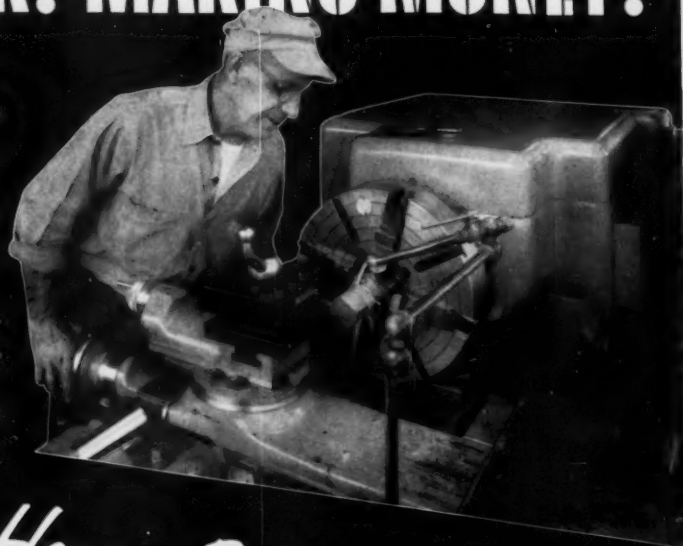
Kenneth P. Martin, vice-president and general manager of the LeMaire Tool & Mfg. Co.

# MAN AT WORK! MAKING MONEY!

"in the production of  
special precision  
parts...."

HENRY VOGT MACHINE CO.  
LOUISVILLE, KY.

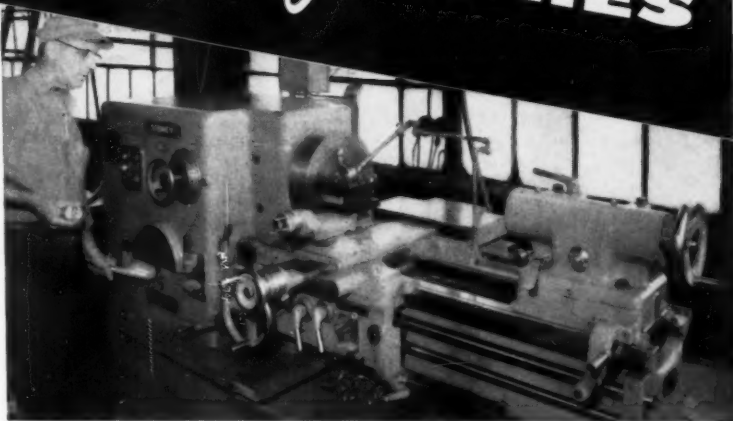
depend on



## SIDNEY *Heavy-Duty* LATHES

The scales turn in favor of SIDNEY HEAVY DUTY LATHES on any type of work . . . turning standardized "mass production" work in impressive quantities . . . or turning special precision parts, as illustrated in this photograph. Henry Vogt Machine Co. makes forged steel valves and fittings, water tube boilers, refrigerating machinery and other equipment.

The type or quantity of work doesn't phase these lathes . . . it's all part of the "cost-less, produce-more" story.



**AUTOMATIC, HYDRAULIC DIAL CONTROLLED CHANGE  
32 SELECTIVE SPINDLE SPEEDS IN GEOMETRIC PROGRESSION**

—one of the many Sidney "firsts" which have  
been making history as far back as 1947.

**SIDNEY LATHES** are precision tools, designed for rigidity, accuracy and dependability, regardless of the severity of the operation performed. Exceptionally smooth and quiet. A size and speed available for your plant.

Write for bulletins or for representative to call at your convenience.

**THE SIDNEY MACHINE TOOL CO. • SIDNEY, OHIO**

*Builders of Precision Machinery since 1904*



**STARRETT PRECISION MAKES GOOD PRODUCTS BETTER**



**Starrett Flat Stock and Die Stock**

- Over 1000 sizes, precision ground to Starrett standards of finish and accuracy
- 4 types — air, oil, oil or water and water hardening
- 40 thicknesses from 1/64" to 3"
- Widths from 7/64" to 14"

**STARRETT precision ground FLAT STOCK and DIE STOCK**  
fastest way to make small parts . . . costs less

*Just lay it out and saw it out . . .* that's how Starrett Precision Ground Flat Stock and Die Stock help you handle those many special jobs that tie up valuable men and machines.

Anything with two flat parallel sides can be produced quickly and economically . . . no time lost hunting up stock — no slow and costly grinding to size. Choose the exact width, thickness and hardening characteristics you need.

Your Industrial Supply Distributor offers dependable service on Starrett Precision Ground Die Stock and Flat Stock — each piece marked for type and size and individually packaged in protective envelope. A new, compact, quick look-up chart lists all types and sizes with hardening instructions. Ask him for your copy or write Dept. D. The L. S. Starrett Company, Athol, Massachusetts, U. S. A.



**Visit Booth 1730**  
**National Metals Show**

**Starrett®**

**FLAT STOCK and DIE STOCK**

*World's Greatest Toolmakers*

PRECISION TOOLS • DIAL INDICATORS • STEEL TAPES • GROUND FLAT STOCK • HACKSAWS • HOLE SAWS • BAND SAWS • BAND KNIVES

# MACHINERY'S DATA SHEET

## Wrought Aluminum Alloys in Order of Increasing Ultimate Strength

Alloy and Temper	Yield Strength		Alloy and Temper	Yield Strength		Alloy and Temper	Yield Strength	
	Ultimate Strength	Pounds per Square Inch		Ultimate Strength	Pounds per Square Inch		Ultimate Strength	Pounds per Square Inch
EC-0	12,000	4,000	5052-0	28,000	13,000	5056-0	42,000	22,000
1100-0	13,000	5,000	5357-H36	28,000	26,000	5154-H34	42,000	33,000
1100-H12	15,500	14,000	6951-T6 (Air)	29,000	18,000	Alclad 6061-T6	42,000	37,000
3003-0	16,000	6,000	5050-H36	29,000	26,000	2117-T4	43,000	24,000
5005-0	17,000	6,000	3003-H18	29,000	27,000	5154-H36	45,000	36,000
6062-0	17,000	6,500	5005-H18	29,000	28,000	6061-T6	45,000	40,000
Alclad 6061-0	17,000	7,000	Alclad 3004-H32	30,000	21,000	6062-T6	45,000	40,000
1100-H14	18,000	8,000	6063-T5	30,000	25,000	6063-T832	45,000	40,000
5357-0	18,000	16,000	5005-H38	30,000	28,000	5154-H38	47,000	39,000
3003-H12	19,000	7,000	3004-H32	31,000	22,000	Alclad 5055-H34	48,000	36,000
6951-0	19,000	17,000	5050-H38	31,500	29,000	2118-T72	48,000	37,000
6951-T4 (Air)	20,000	20,000	Alclad 7075-0	32,000	14,000	6151-T6	48,000	43,000
5050-0	20,000	6,500	Alclad 6061-T4	32,000	19,000	2118-T71	50,000	40,000
6951-T3	20,000	8,000	6063-T831	32,000	29,000	Alclad 5055-H36	52,000	40,000
5005-H32	20,000	13,000	5357-H38	32,000	30,000	2118-T61	55,000	40,000
1100-H16	20,000	17,000	7075-0	33,000	15,000	4032-T6	55,000	46,000
6063-T42	21,000	19,000	Alclad 6061-T4	33,000	19,000	2011-T3	55,000	48,000
5357-H32	22,000	13,000	Alclad 3004-H34	33,000	26,000	2025-T6	58,000	37,000
3003-H14	22,000	19,000	5154-0	34,000	15,000	2011-T8	59,000	45,000
5005-H34	23,000	20,000	3004-H34	34,000	27,000	5056-H38	60,000	50,000
1100-H18	24,000	22,000	5052-H32	34,000	27,000	Alclad 2014-T4	61,000	37,000
5050-H32	24,500	20,500	5154-H112	35,000	16,000	2018-T61	61,000	46,000
Alclad 3004-0	25,000	9,000	6061-T4	35,000	21,000	2014-T4	62,000	40,000
Alclad 2014-0	25,000	10,000	6062-T4	35,000	21,000	2117-T4	62,000	40,000
6951-T4 (Water)	25,000	11,000	6063-T6	35,000	30,000	Alclad 2014-T3	63,000	40,000
5357-H34	25,000	22,000	Alclad 3004-H36	36,000	30,000	5056-H18	63,000	59,000
3004-0	26,000	10,000	3004-H36	37,000	31,000	Alclad 2024-T4	64,000	42,000
2017-0	26,000	10,000	5052-H34	37,000	31,000	Alclad 2024-T3	64,000	44,000
Alclad 2024-0	26,000	11,000	Alclad 5055-0	38,000	20,000	2618-T61	64,000	54,000
3003-H16	26,000	24,000	Alclad 3004-H38	38,000	33,000	Alclad 2024-T81	65,000	60,000
5005-H36	26,000	24,000	6063-T83	38,000	36,000	Alclad 2024-T36	67,000	53,000
5005-H16	26,000	25,000	Alclad 5055-H111	39,000	24,000	2024-T4	68,000	48,000
2024-0	27,000	11,000	5154-H32	39,000	29,000	Alclad 2014-T6	68,000	60,000
2014-0	27,000	14,000	6951-T6 (Water)	39,000	34,000	Alclad 2014-T3	70,000	50,000
EC-H19	27,000	24,000	5052-H36	39,000	34,000	2014-T6	70,000	60,000
5050-H34	27,500	24,000	3004-H38	40,000	34,000	Alclad 2024-T86	70,000	66,000
			5052-H38	41,000	36,000	2024-T36	73,000	57,000
			Alclad 6061-T6	41,000	36,000	Alclad 7075-T6	76,000	67,000
						7075-T6	82,000	72,000

Compiled by Reynolds Metals Co.

# MACHINERY'S DATA SHEET

## Wrought Aluminum Alloys in Order of Increasing Hardness

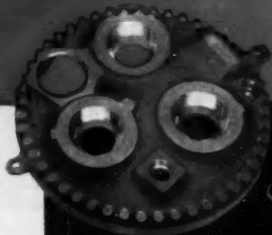
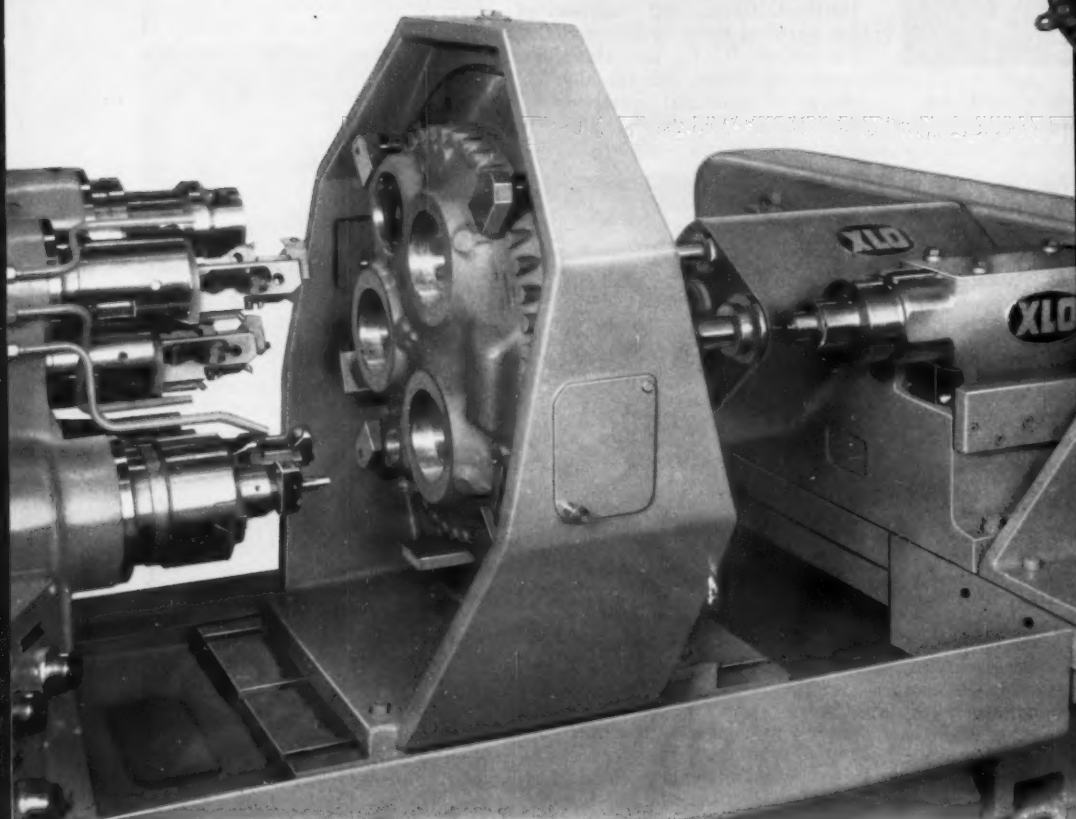
Alloy and Temper	Brinell Hardness*	Alloy and Temper	Brinell Hardness*	Alloy and Temper	Brinell Hardness*
1100-O	23	2024-O	47	3004-H38	77
1100-H12	28	5050-H34	50	5154-H36	78
3003-O	28	5005-H38	51	6063-T83	82
5005-O	28	5357-H36	51	5154-H112	83
6061-O	30	3004-H32	52	5052-H38	85
6062-O	30	3003-H18	55	2011-T3	95
1100-H14	32	5050-H36	55	2218-T72	95
5357-O	32	5357-H38	55	6061-T6	95
3003-H12	35	5154-O	58	6062-T6	95
5050-O	35	7075-O	60	6063-T832	95
5005-H32	36	5052-H32	62	2011-T8	100
1100-H16	38	3004-H34	63	6151-T6	100
3003-H14	40	5050-H38	63	2014-T4	105
5357-H32	40	5056-O	65	2017-T4	105
5005-H34	41	6061-T4	65	5056-H18	105
6063-T42	42	6062-T4	65	5056-H38	105
1100-H18	44	6063-T5	65	2025-T6	110
3004-O	45	5052-H34	67	2018-T61	120
2014-O	45	5154-H32	67	2024-T3	120
2017-O	45	3004-H36	70	2024-T4	120
5050-H32	45	2117-T4	70	4032-T6	120
5052-O	45	6063-T831	70	2024-T36	130
5357-H34	45	5154-H34	73	2014-T6	135
5005-H36	46	6063-T6	73	7075-T6	150
3003-H16	47	5052-H36	74		

\*500 KG Load; 10-mm Ball

Compiled by Reynolds Metals Co.

# How to precision finish 42 surfaces in one cycle

AND HOLD TOLERANCES TO .001"



Back and front view of the bored casting. Part will eventually house a precision gear train. All hole sizes and locations are held to .001" tolerances.

Close-up of part mounted in its hydraulically-operated fixture. Notice straddle facing tools mounted on boring spindles.

**XLO**

EX-CELL-O  
FOR  
PRECISION

57-70

These magnesium cast aircraft gear housings are being bored, faced and chamfered, 42 precision operations overall in one cycle on a single Ex-Cell-O 17-A precision boring machine! What's more, all diameters and locations are being held to .001" tolerances.

The ability of this and other Ex-Cell-O boring machines to perform multiple precision operations is recognized throughout the metalworking industry. This reputation, backed by years of leadership, is your assurance that precision boring is best done by an Ex-Cell-O machine.

For full information on the complete line of Ex-Cell-O precision boring machines, including the one best suited

to your production standards, get in touch with your local Ex-Cell-O Representative. Or, if you prefer, write direct to Ex-Cell-O, Detroit.

**EX-CELL-O**  
CORPORATION  
DETROIT 32, MICHIGAN

*Machinery  
Division*

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • TORQUE ACTUATORS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT





R. E. Esch, newly elected vice-president of Vickers Incorporated

VICKERS INCORPORATED, Detroit, Mich., announces the following executive appointments: R. E. ESCH, general manager of the company's International Division, was elected vice-president of the company; GEORGE C. NORDENHOLT has been appointed industrial hydraulics application engineer in the company's Springfield, N. J., office; HARRY H. CARLSON has joined the staff of the company's Cincinnati, Ohio, office as industrial hydraulics application engineer; and WILLIAM A. HAGERTY was named industrial application engineer in the company's metropolitan Philadelphia (Media, Pa.) office.

DETROIT TAP & TOOL CO., Base Line, Mich., announces five appointments of distributors for its line of "Specific" taps and other threading tools and gages. They are: J. L. AXELSON CO., 2499 Huntington Drive, San Marino, Calif.; ROBERT O. BUTLER CO., Manlius, N. Y.; CASCADE TOOL SALES, 2100 S. W. Jefferson St., Portland, Ore.; LAUDERDALE TOOLS, Fort Lauderdale, Fla.; and MIDWEST SUPPLY CO., 719 N. Lewis St., Tulsa, Okla.

WHELOCK, LOVEJOY & CO., INC., announces the opening of a newly constructed office and warehouse to serve the Detroit area. This new building is located at 23220 Pine-wood Ave., Warren, Mich., and will stock the complete line of Wheelock, Lovejoy Hy-ten, A.I.S.I., and S.A.E. alloy steels. Mr. Edward S. Waltz will continue as district manager.

JOHN BISHOP has been named Detroit regional sales manager for Micromatic Hone Corporation, Detroit, Mich. He has been with the company since 1948.

DONALD K. BALLMAN, general sales manager of Dow Chemical Co., Midland, Mich., has been promoted to the position of director of sales.

JOSEPH T. RYERSON & SON, INC., warehousing subsidiary of Inland Steel Co., Indianapolis, Ind., announces the opening of a new steel service plant at 6701 E. English Ave.

## New England

EDWARD P. GILLANE, president of Pratt & Whitney Co., Inc., West Hartford, Conn., and chairman of the board of Potter & Johnston Co., Pawtucket, R. I., has also been named executive vice-president in charge of industrial operations for Penn-Texas Corporation. He will



Edward P. Gillane, executive vice-president industrial operations, Penn-Texas Corporation

continue as chief executive officer of Pratt & Whitney, a Penn-Texas subsidiary. Mr. Gillane first joined Pratt & Whitney in 1948 when he became vice-president and controller of the company's Potter & Johnston subsidiary. He was made president and general manager of Potter & Johnston in 1955 and was elected president of Pratt & Whitney in 1956.

AVERY SMITH has been appointed assistant to the general manager of Comco, Inc., division of Enthone, Inc., New Haven, Conn.

WILCO MACHINE TOOL CO., INC., has moved its offices and production facilities to a new plant on Route 6, Bolton, Conn.

FREDERICK H. EDWARDS, JR., has been appointed field representative for the Atrax Co., Newington, Conn.

WHITNEY CHAIN CO., Hartford, Conn., announces the following appointments: CURTIS G. GREEN, JR., has been named Southwestern regional manager with headquarters at the company's Dallas, Tex., field office. ROBERT C. ATKINS has been appointed manager of a newly created marketing department at Hartford, Conn.; and LLOYD I. FRASER has been named district manager of the company's Detroit office.

C. VINCENT SCIULLO has been appointed assistant manager of the Cold-Heading Machinery Division of the Waterbury Farrel Foundry & Machine Co., Waterbury, Conn. Mr. Sciullo returns to the company's home office from Cleveland, Ohio, where he has been manager of the Cleveland sales office since 1956. He has been with the company since 1936.

JAY E. WATSON has become chief engineer, conventional gages, of the Pratt & Whitney Co., Inc., West Hartford, Conn. Mr. Watson was chief of the Ordnance Gage Center at Frankford Arsenal since 1952.

FRED JOHNSON has been appointed sales engineer of MacDermid, Inc., Waterbury, Conn.

PRENTISS L. SMITH has been appointed to the newly created position of sales manager of spindles of the Bryant Gage and Spindle Division, Bryant Chucking Grinder Co., Springfield, Vt. Mr. Smith will be in charge of the sales of the company's magnetic memory drums for computers, high-speed motors, and spindles for machine tools.

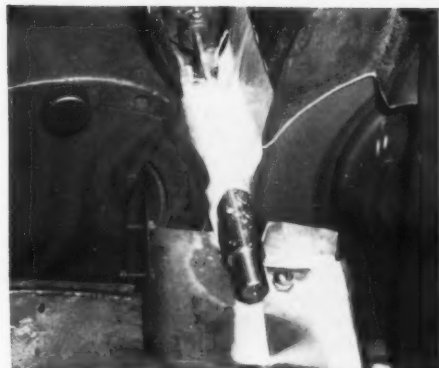
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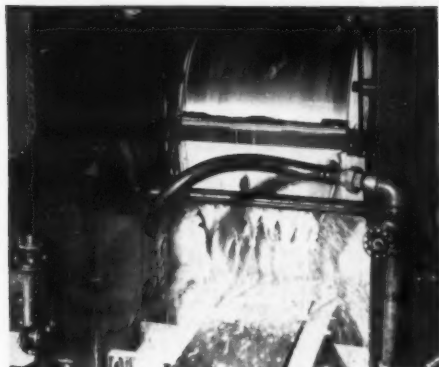
Prentiss L. Smith, sales manager of spindles, Gage and Spindle Division, Bryant Chucking Grinder Co.



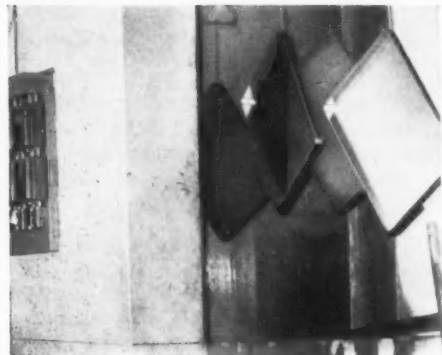
**CUTTING**



**GRINDING**



**ROLLING**



**WASHING**

## HOW SUNOCO EMULSIFYING OILS HELP YOU CUT COSTS

*The S.E.C.O. series will meet  
all your emulsifying oil needs*

**REGULAR** • Sunoco® Emulsifying Cutting Oil (S.E.C.O.) is a low-cost general-purpose oil for most cutting and grinding applications. Operators like S.E.C.O.—it makes clean emulsions that stand the gaff of long production runs. Its superior rustproofing ability protects both machines and work.

**HEAVY-DUTY** • S.E.C.O. HD emulsions have film strengths more than twice those of regular emulsifying oils. This extra strength, plus high oiliness, gives you a low-cost way to machine today's tough alloys and "hot" jobs.

**SPECIAL** • Custom grades of Sunoco Emulsifying Cutting Oil are made to meet unusual hard-water conditions. Other special formulations are used in rolling steel, brass, aluminum . . . in hot and cold washing . . . in rustproofing . . . and in many other applications.

**FOR FULL INFORMATION:** Call your Sun representative or write for Technical Bulletin 16 (S.E.C.O.) and Technical Bulletin 11 (S.E.C.O. HD). Write to SUN OIL COMPANY, Philadelphia 3, Pa., Dept. M-10.

**Industry uses more Sunoco Emulsifying Oil  
than any other emulsifying oil.**



**INDUSTRIAL PRODUCTS DEPARTMENT**

**SUN OIL COMPANY PHILA. 3, PA.**

IN CANADA: SUN OIL COMPANY LIMITED, TORONTO AND MONTREAL

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Paul W. Leming newly elected vice-president of Van Norman Machine Co.

PAUL W. LEMING has been elected executive vice-president of the Van Norman Machine Co., Division of Van Norman Industries, Inc., Springfield, Mass. Mr. Leming has a background of over twenty-five years in machinery design and production. His experience includes twelve years with Cincinnati Milling Machine Co. in various capacities. Mr. Leming comes to Van Norman directly from his duties as works manager of King Machine Tool and Elmes Engineering Divisions of American Steel Foundries. He will take complete charge of the manufacturing and engineering of Van Norman Machine Co.

REED-PRENTICE CORPORATION of Worcester, Mass., announces the following appointments: DOUGLAS G. EATON has been made sales manager of vacuum die-casting equipment, and JOSEPH P. ZEMLANEK has been named sales engineer in the company's Cleveland office.

ROBERT M. KINNEY has been appointed southeastern district sales engineer for the Electronics & Instrumentation Division, Waltham, Mass., of the Baldwin-Lima-Hamilton Corporation.

ANDREW SUTHERLAND has been appointed director of industrial relations of Miniature Precision Bearings, Inc., Keene, N. H.

### New York and New Jersey

WENCEL A. NEUMANN, executive vice-president of De Laval Separator Co., Poughkeepsie, N. Y., has assumed the responsibility of the company's Industrial Division sales and

sales policies in addition to his previous responsibilities in the manufacturing, engineering, and industrial relations divisions. Also named to new posts were G. FREDERICK WHEELWRIGHT, assistant to the executive vice-president; FRANK E. LAWATSCH, manager of industrial equipment application; and WILLIAM C. PORCH, manager of industrial sales for the company's eastern district.

J. E. BRINCKERHOFF, vice-president of Babcock & Wilcox Co., New York City, has been unanimously elected president of the Refractories Institute at a meeting of its board of directors held recently in White Sulphur Springs, W. Va. The Institute with headquarters in Pittsburgh is a non-profit trade association.



J. E. Brinckerhoff, new president of the Refractories Institute

PAUL P. MALLOY has been appointed vice-president of operations of the Kemet Co., Division of Union Carbide Corporation, New York City. Mr. Malloy has been associated with the Union Carbide organization since 1915, when he went to the National Carbon Co.'s plant in Clarksburg, W. Va.

C. E. FORD has been named to the newly created position of new products marketing manager by the National Carbon Company, Division of Union Carbide Corporation, New York City.

ARTHUR P. HESSE has been appointed district sales manager for the Cincinnati area of the Aluminum Safety Products, Inc., New York City.

ROBERT L. GRUNEWALD has been appointed manager of manufacturing

for General Electric Co.'s Gas Turbine Department, Schenectady, N. Y.

WILLIAM H. BALENTINE has been promoted from assistant manager to manager of the Instrument Division of Thomas A. Edison Industries, West Orange, N. J.

### Ohio

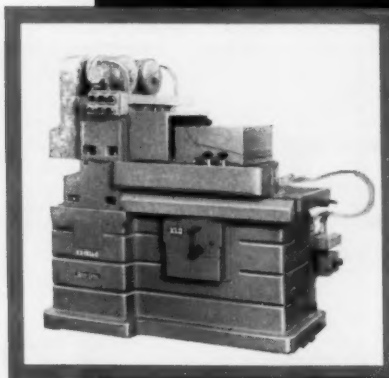
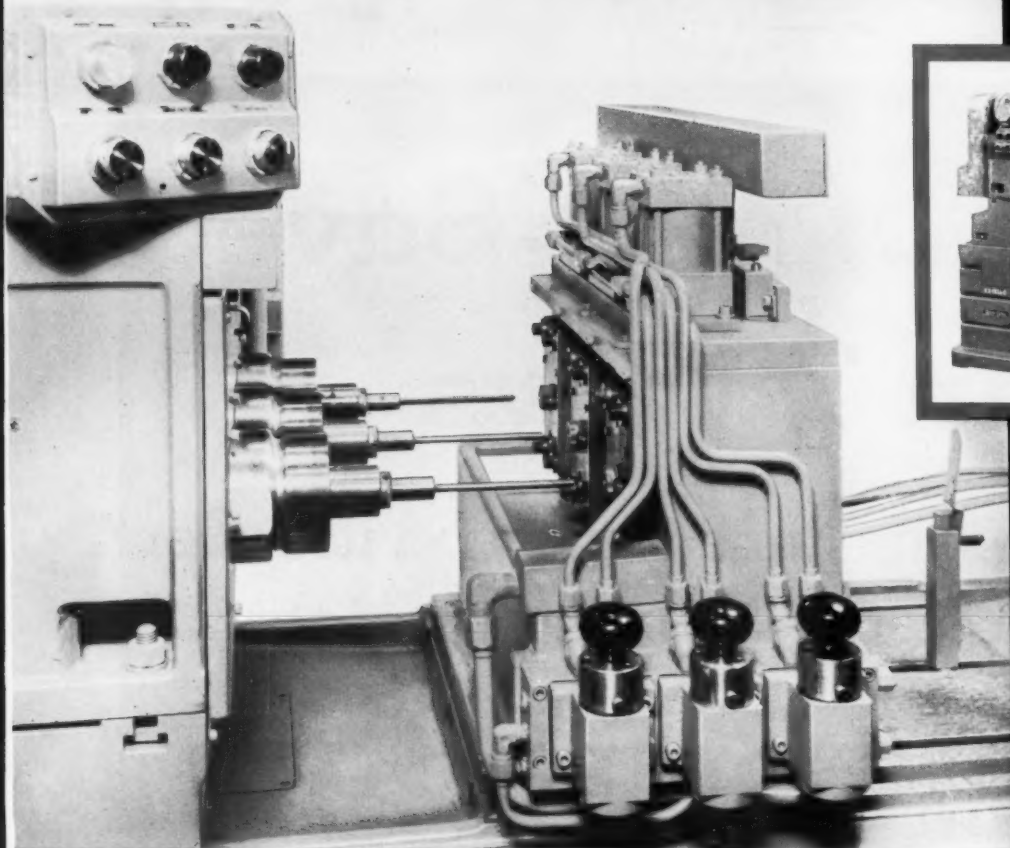
RELiance ELECTRIC & ENGINEERING Co., Cleveland, Ohio, announces the following appointments: JOHN L. VANNORT, formerly manager of application engineering, became regional sales manager for the midwest region and is succeeded by ROBERT O. GEE whose former position of manager of service is taken by GEORGE E. LAW. WILLIAM C. MCCONNELL moves up from manager of Standard Products Division to manager of general products. ANTHONY P. DIVINCENZO has been appointed manager of control engineering, and JOHN J. DAILEY, JR., manager of control manufacturing at the company's Euclid plant. FRANK R. TERRANT was named assistant manager of the company's Ivanhoe Division.

DWIGHT A. BESSMER has been elected executive vice-president of the Timken Roller Bearing Co., Canton, Ohio. Starting with the company in 1933, he completed a training course in the Canton plant and was sent to the company's Automotive Division as a service engineer. He then became a sales engineer in the Detroit area, and in 1940, entered the company's purchasing department. In 1942 he was named director of purchases; in 1950, assistant to the vice-president; and in 1953 he was elected a vice-president, a position he held until his present election.

JOHN MONTEAN has been appointed manager of the Cri-Dan Division of Lees-Bradner Co., Cleveland, Ohio. Mr. Montean has been with the company for four years, starting as a design draftsman. When the Cri-Dan Division was established, he served first as the division's chief tool designer and was later promoted to the position of assistant manager.

CLEVELAND PUNCH & SHEAR WORKS Co., Cleveland, Ohio, announces the appointment of W. W. RICHARDSON Co., 904 Winston Drive, Melrose Park, Ill., as representative in the Illinois territory. At the same

(Continued on page 266)



A standard Style 112-D Precision Boring Machine equipped for Bor-Drill work.

Bor-Drilling on a standard 112-D Precision Boring Machine. This three-station set-up produces close-tolerance holes, smooth finish.

## BOR-DRILL

**PRODUCES .312-.313 DIAMETER PRECISION THROUGH HOLES IN 2½" SOLID METAL**

**THE PROBLEM:** an auto manufacturer wanted to produce accurate, close-tolerance holes from the solid in small transmission parts without costly secondary operations.

**THE SOLUTION:** Ex-Cell-O Style 112-D Precision Boring Machines equipped for Bor-Drilling. These machines are Bor-Drilling .312"-.313" diameter through holes for a distance of 2½", three at a time in transmission range selector shaft.

**WHAT IS BOR-DRILLING?** Bor-Drill is a new way of driving gun drills, adapted to high production-with-accuracy requirements. Bor-Drilling is especially effective when machining from the solid holes too long for single-tool boring applications, and holes in which it is difficult to maintain finish size. Bor-Drilling requires no secondary finishing operations in most cases. Ask your Ex-Cell-O Representative or write Ex-Cell-O, Detroit for Bulletin 311162 explaining all about Bor-Drilling.

**EX-CELL-O**  
CORPORATION  
DETROIT 32, MICHIGAN

*Machinery Division*

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • TORQUE ACTUATORS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT



EX-CELL-O FOR  
PRECISION



Bor-Drilling turns out straight, accurate holes — such as these held to .312"-.313" diameter for 2½ inches.



# How **SKF** Saved in 7 Ways

and at the same time improved its roller  
bearing cages by using the right

## Revere Brass Strip

**SKF** Industries, Inc., Philadelphia, Pa., like other progressive organizations, is constantly seeking new ways to improve its products and at the same time cut production costs.

With this in mind they recently reviewed the kind of brass which was being used in

their spherical roller bearing cages from the standpoints of quality and fabrication. It was then that Revere's Technical Advisory Service studied the problem first-hand and made recommendations to the **SKF** production and engineering departments.



**SKF** IMPROVED TYPE "C" Spherical Roller Bearing cut away to show how the cage, made of Revere Brass Strip, fits into the bearing. Due to its advanced internal design, this bearing provides greatly increased capacity and service life.

HERE IS "window-type" cage of **SKF** Spherical Roller Bearing, made in two pieces, one for each row of rollers. Cage is made from rugged Revere Brass Strip at the Shippensburg, Pa., plant of **SKF** Industries, Inc.



The result was the adoption of specification changes in brass strip as recommended by Revere which gave **SKF** these 7 money, time and tool-saving advantages:

- 1** One bore pressing operation has been eliminated. Machining is more easily accomplished. Less machining is required.
- 2** Tool life has been increased with some speeds increased up to 100% and feeds up to 30%.
- 3** Rework due to burrs has been greatly reduced. One step less is required in the deburring operation while savings through reduced cycle time for remaining deburring operations are up to 40%.
- 4** Chips are small now . . . there is no "angel hair" to clutter work area.
- 5** Life of punch used in notching roller bearing cage has been doubled. Now a run may be completed without making tool adjustments due to sharpening tools.
- 6** Machining speeds and feeds have been substantially increased over those in machining the former alloy.
- 7** Die setters report that considerable work has been eliminated in setting up the tools used.

And, all of these money-saving things were accomplished without sacrificing quality—in fact the quality of these roller bearing cages was improved!

This is still another eye-opening example of Revere supplying the metal that will do the best job and with the greatest economy . . . be it brass, copper or aluminum or any one of their alloys.

Why not call in Revere's Technical Advisory Service to review your operation? It may mean money saved with an improved product to boot.

#### REVERE COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801  
230 Park Avenue, New York 17, N.Y.

Mills: Baltimore, Md.; Brooklyn, N.Y.; Chicago, Clinton and Joliet, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Newport, Ark.; Rome, N. Y. Sales Offices in Principal Cities, Distributors Everywhere.



time, LIN ASSOCIATES, 76 Strathmore Ave., Brighton, Mass., were appointed representatives in the New England states.

ROBERT E. THOMAS has been named general sales manager of the Cleveland Cap Screw Co., Cleveland, Ohio, a subsidiary of Standard Pressed Steel Co., Jenkintown, Pa. At one time assistant general sales manager at Cleveland, Mr. Thomas rejoins the company after two and one-half years as sales manager of Triplex Screw Co., also of Cleveland.

DANA CORPORATION, Toledo, Ohio, announces three promotions in the engineering department: RAY REED has been named chief engineer of the railroad division; NORMAN REVENAUGH has been appointed mechanical transmission engineer; and WILLIAM TRISLER has been named universal joint engineer.

N. J. KASSNEL has been appointed district manager of Verson Allsteel Press Co.'s newly opened Cleveland sales office located at 5530 State Road, Cleveland, Ohio. Mr. Kassnel, vice-president of the company, has already assumed his duties at the new headquarters.

FEDERAL MACHINE & WELDER Co., Warren, Ohio, has acquired a controlling interest in BERKELEY-DAVIS, INC., Danville, Ill., builders of special machinery, specializing in automatic arc-welding equipment.

ROBERT C. BEVIS has been appointed assistant sales manager, domestic sales, of the Cincinnati Milling Machine Co., Cincinnati, Ohio. He has been with the company since 1938.

PARKER APPLIANCE Co., Cleveland, Ohio, has entered into an agreement for the purchase of all stock of Hannifin Corporation, Des Plaines, Ill.

CLARENCE W. RAUFUS has been appointed assistant district manager of the Cincinnati sales office of Motch & Merryweather Co., Cleveland, Ohio.

JOHN PETROVICH has been appointed sales manager and assistant to the general manager for Mohawk Tools, Inc., Montpelier, Ohio.

THE OHIO PISTON Co., Cleveland, Ohio, is changing its name to Ohio Piston & Machining Co., effective this month.

## Obituaries



William Ernst Caldwell

WILLIAM ERNST CALDWELL, chairman of the board of the Cleveland Twist Drill Co., Cleveland, Ohio, died on August 22 at the age of seventy-three years. On the same day, HAROLD C. HURTT, assistant to the vice-president of sales, died suddenly following a heart attack. He was forty-five years old.

Mr. Caldwell started with the company in 1901. He was elected vice-president and director of sales and served in this capacity until 1956. In addition, he was elected chairman of the board in 1953, a position he held until his death.

Mr. Hurtt was appointed assistant manager of sales in 1951, and in 1957, assistant to the vice-president of sales.

DR. IRVING LANGMUIR died at Falmouth, Mass., on August 16 at the age of seventy-six years. Dr.



Dr. Irving Langmuir

Langmuir, Nobel prize-winning scientist, was on the staff of General Electric Research Laboratory from 1909 until his retirement in 1950.

WILLIAM J. MAGEE, retired treasurer and director of Norton Co., Worcester, Mass., died on August 26 at the age of sixty-eight years. Mr. Magee retired in 1955 after a career of twenty-five years in various financial positions of the company.

ROBERT S. ROSE, Boston district manager of Latrobe Steel Co., died on August 26.

## Coming Events

OCTOBER 7-9—ASLE-ASME Lubrication Conference will be held in the Royal York Hotel, Toronto, Canada. Highlights of the conference on lubrication and wear, recently held in London, England, will be presented. For further information contact G. R. Street, conference manager, Royal York Hotel, Toronto, Canada.

NOVEMBER 4-8—Three national meetings have been announced by the Society of Automotive Engineers to be held in the Hotel Statler, Cleveland, Ohio. The SAE National Transportation meeting is scheduled for November 4 to 6; the SAE National Diesel Engine meeting, for November 5 and 6; and the SAE National Fuels and Lubricants meeting, for November 7 and 8. General chairman is Theodore R. Thoren of Thompson Products, Inc., 23555 Euclid Ave., Cleveland 17, Ohio.

NOVEMBER 4-6—Ninth Annual American Institute of Electrical Engineers' Machine Tool Conference will be held in the Hotel Schroeder, Milwaukee, Wis. Harry Ankeney of Giddings & Lewis Machine Tool Co., Fond du Lac, Wis., is the general chairman. The conclave is sponsored by the Machine Tool Subcommittee of the AIEE.

JANUARY 27-30—1958 Plant Maintenance and Engineering Show, which returns to Chicago for the first time in three years, will be held in the International Amphitheatre. The Annual Plant Maintenance and Engineering Conference is also set there for the same week. For further information contact Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.



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ILLINOIS  
...and be sure of  
gears at their finest!**

There is so much more to gears than meets the eye... particularly when these gears are made by ILLINOIS!

For here at ILLINOIS, the great strides taken to maintain highest standards of precision and quality have resulted in the manufacture of the finest gears in the world.

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If you use, specify or buy gears... choose ILLINOIS GEARS with confidence for quality you can trust!

Or, as our many friends throughout industry put it:  
"Say ILLINOIS and be sure of gears at their finest!"

Look for this mark  the symbol on finer gears



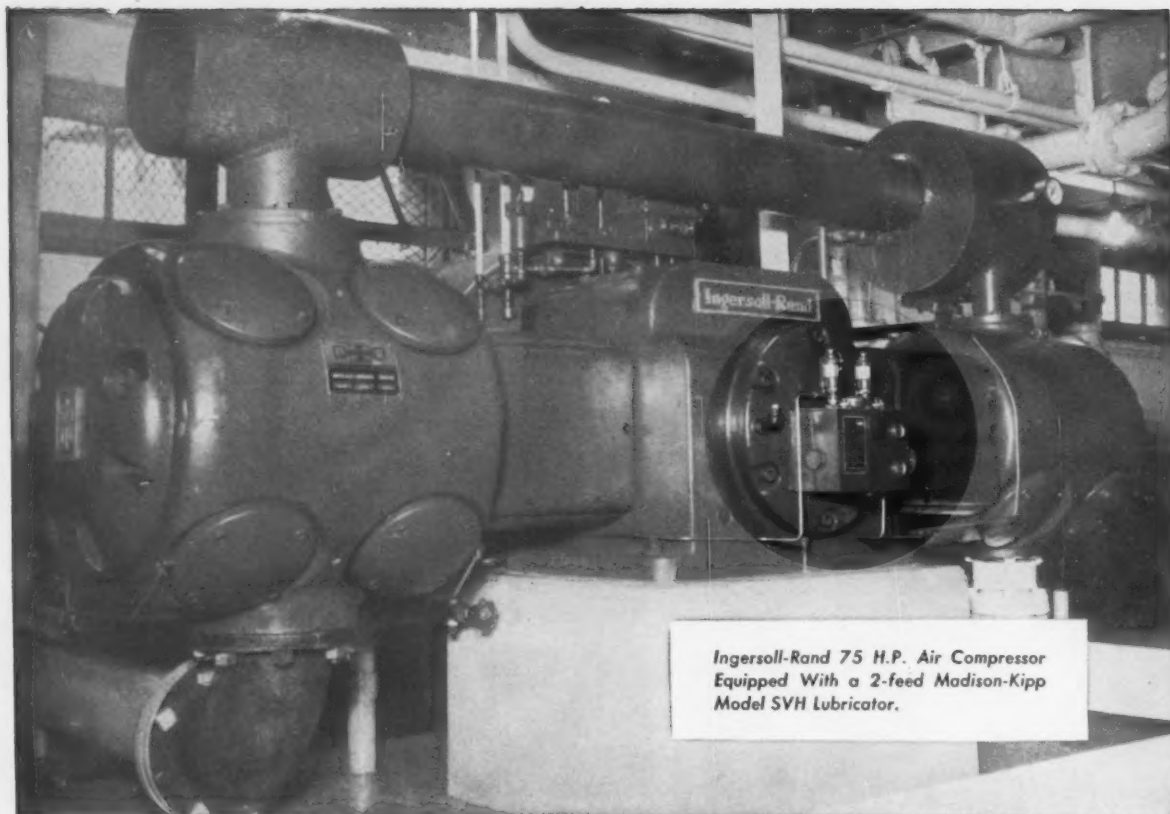
*Gears for Every Purpose* — one gear or 10,000 or more

**ILLINOIS GEAR & MACHINE COMPANY**

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**Machines of great performance use the most dependable oiling system ever developed**

**MADISON-KIPP**

*Fresh Oil*

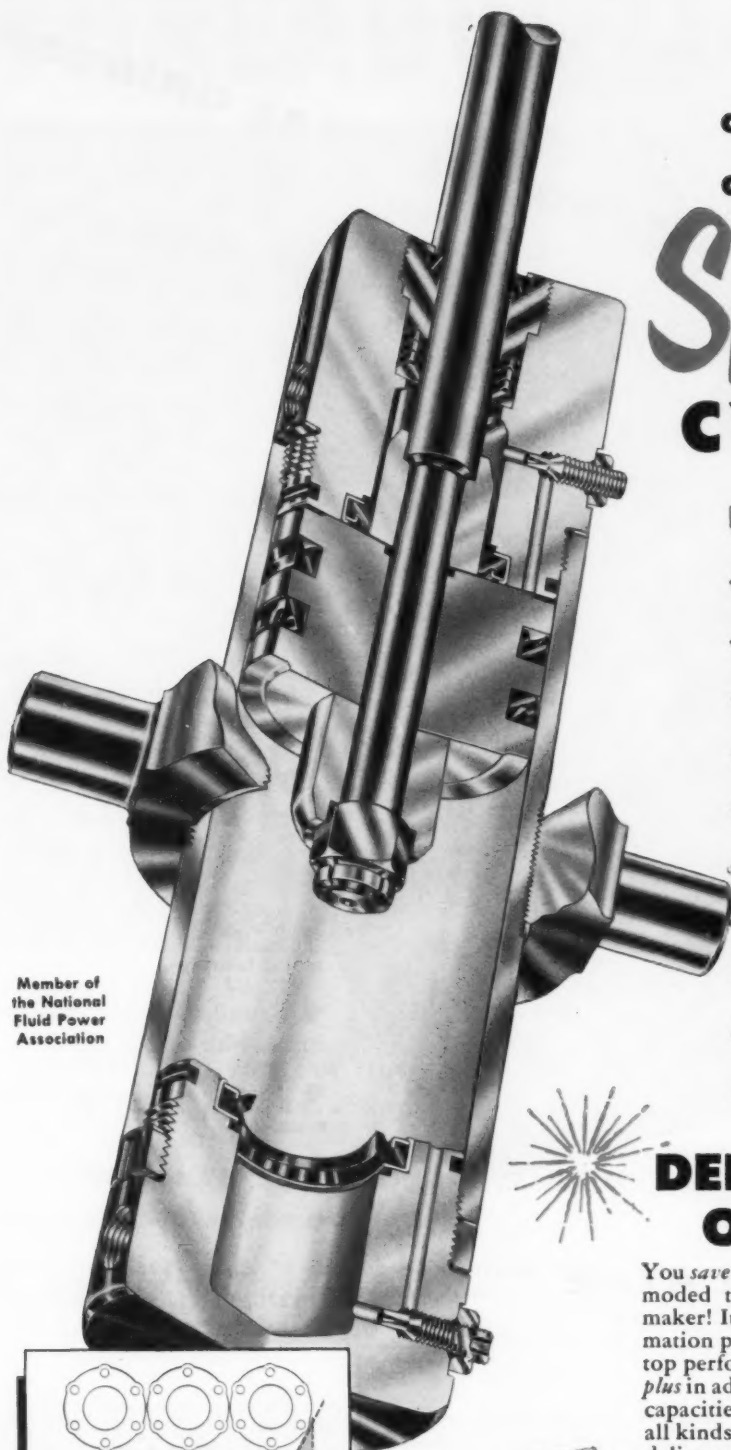
... by the measured drop, from a Madison-Kipp Lubricator is the most dependable method of lubrication ever developed. It is applied as original equipment on America's finest machine tools, work engines and compressors. You will definitely increase your production potential for years to come by specifying Madison-Kipp on all new machines you buy, where oil under pressure fed drop by drop can be installed. There are 6 models to meet almost every installation requirement.



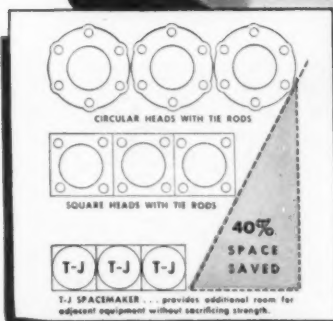
**kipp**

**MADISON-KIPP CORPORATION**  
203 WAUBESA STREET • MADISON 10, WIS., U.S.A.

- Skilled in Die Casting Mechanics
- Experienced in Lubrication Engineering
- Originators of Really High Speed Air Tools



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# all the **EXTRAS** are standard with **T-J** *Spacemaker* **CYLINDERS**

- **NEW** exclusive ingenious cushion designs . . . Super Cushion Flexible Seals for Air . . . New Self-Aligning Master Cushion for Oil.
- **STRONGER** than outmoded tie rod design, proven through actual tests. No tie rods to stretch.
- **SOLID STEEL HEADS** throughout the full line.
- **COMPACT DESIGN** eliminates tie rods, increasing the strength and reducing mounting space required, providing extra room for adjacent equipment.
- **HARD CHROME PLATED** body bores and piston rods . . . assure you of long trouble-free service. (Standard at no extra cost.)
- **METALLIC ROD SCRAPER**, not just a wiper, actually removes foreign matter from the rod.
- **PILOTED PACKING GLAND** with extra long bearing. Additional strength and support to the piston rod.
- **OIL** pressure to 750 p.s.i. AIR to 200 p.s.i.

## **DELIVERY OFF THE SHELF!**

You save 40% space when you switch from outmoded tie rod cylinders to the T-J Spacemaker! It's stronger, too! Fits right into automation programs in countless plants. Delivers top performance and dependability with a big *plus* in advanced features. Wide range of styles, capacities . . . reduces man-hours and costs in all kinds of push-pull-lift operations. Off-shelf delivery in 64,000 combinations!

**NEW LITERATURE**—Send today for new Catalog SM56 with complete engineering details on Spacemaker line. Write The Tomkins-Johnson Co., Jackson, Mich.

**T-J TOMKINS-JOHNSON**  
PNEUMATIC, AIR AND HYDRAULIC CYLINDERS, SUCTION, CLIMBERS

# SOUTH BEND PEDESTAL GRINDER

## Better, Faster, Easier Grinding



**FREE**

**CATALOG 5700**

80 pages, over 300 illustrations.  
Send for your copy.

- Greater work clearance—no motor interference.
- Rigid—heavy duty construction throughout.
- Motor mounted in pedestal—protected from dust and dirt.
- Exceptionally smooth running.
- V-belt drive to grinding wheel spindle mounted on sealed ball bearings.
- No grinding wheel load on motor bearings.
- Extra large safety glass eye shields with built-in lights.
- Adjustable U-shaped tool rests.
- Heavy wheel guards.
- Large dust collector outlets.
- 8" model—\$268. 10" model—\$270. f.o.b. factory, less motor.

**SOUTH BEND LATHE**

**SOUTH BEND 22,  
INDIANA**

*Builders of Precision Machine Tools Since 1906*

**SOUTH BEND LATHE, South Bend 22, Indiana**

Please send information on ☐ Pedestal Grinders, ☐ 9" to 16-24" Lathes,  
☐ Milling Machines, ☐ 7" Bench Shapers, ☐ 14" Drill Presses, ☐ Tools  
and Attachments.

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Up to 24 months to pay.

# THREADWELL GAGES



**ACCURACY** you can trust at  
a price you can afford...

**CONTROLLED DIMENSIONAL STABILITY**  
guarantees the accuracy...

**LONGER WEAR LIFE** makes  
your gage dollar go farther...

- Plain Cylindrical Plug Gages
- Taper Plug and Ring Gages—  
Master Setting Disks
- Plain Cylindrical Ring Gages
- Adjustable Limit Gages
- Thread Gages
- Thread Checking Equipment
- Pipe Thread Gages

**SEE YOUR THREADWELL DISTRIBUTOR NOW**

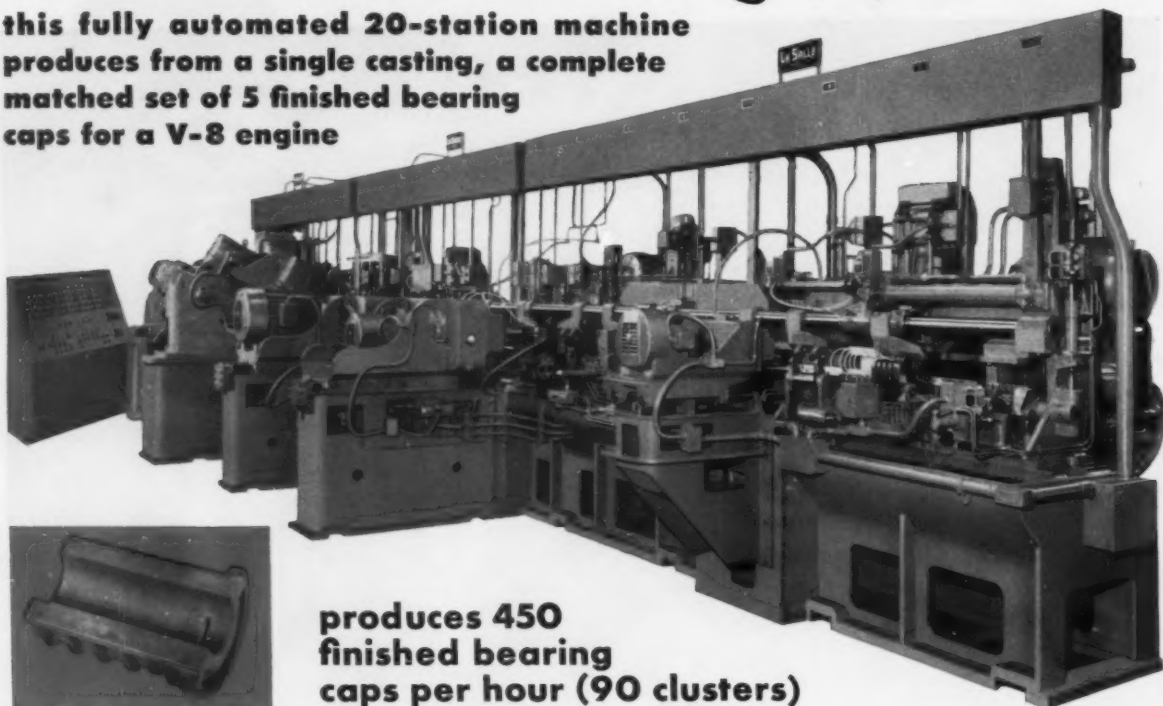


**THREADWELL TAP & DIE COMPANY**  
Greenfield, Mass., U.S.A.



# La Salle bearing-cap-automatic

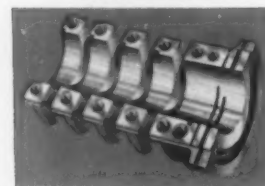
this fully automated 20-station machine produces from a single casting, a complete matched set of 5 finished bearing caps for a V-8 engine



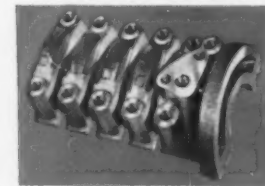
Joint Face Side (Rough)



Rough Cluster



Joint Face Side (Finished)



Finished Cluster

**produces 450  
finished bearing  
caps per hour (90 clusters)**

1. The bearing cap cluster is shuttled into the load station, then rotated 90° so that the joint face is in a vertical plane. The part is then shuttled through the machine using one edge of the channel fit for vertical location and the joint face for in and out location.
2. End wise location is taken with a vee block on bearing cap No. 3—Then the part is clamped.  
Right hand operation is to mill bearing cap cluster to length—Both ends. Left hand operation—drill (4) 1/2 Dia. Holes through.
3. Clamp: Right hand operation—Probe 4 drilled holes.  
Left hand operation—Idle.
4. Locate from drilled hole—bearing cap No. 5 and clamp.  
Right hand operation—Mill oil pump Pad No. 5 Vertical.  
Left hand operation—Ream 2 holes bearing cap No. 3 and drill 4 holes.
5. Locate from reamed hole in bearing cap No. 3 and clamp.  
Right hand operation—Idle.  
Left hand operation—Drill 4 holes through and chamfer two holes in No. 3 bearing cap.
6. Clamp: Right hand operation—Probe 9 holes.  
Left hand operation—Idle.
7. Locate from hole in bearing cap No. 5 and clamp.  
Right hand operation—Drill one angular hole half way in oil pump pad bearing cap No. 5.  
Left hand operation—Chamfer 9 holes.
8. Locate from reamed hole bearing cap No. 3 and clamp.  
Right hand operation—Drill one angular hole to depth in oil pump pad bearing cap No. 5.  
Left hand operation—Ream 8 holes.
9. Clamp: Right hand operation—Idle.  
Left hand operation—Idle.
10. Locate from reamed hole in bearing cap No. 3 and clamp.  
Right hand operation—Spot-face 6 bosses.  
Left hand operation—Idle.
11. Locate from reamed hole in bearing cap No. 3 and clamp.  
Right hand operation—Spot-face 4 bosses.  
Left hand operation—Mill one 2" dia. by .120 slot in bearing cap No. 5.
12. Clamp: Right hand operation—Idle.  
Left hand operation—Idle.
13. Locate from reamed hole in bearing cap No. 3 and clamp.  
Right hand operation—Drill and counter-sink 2 holes in oil pump pad—counterbore oil pump shaft hole.  
Left hand operation—Idle.
14. Locate from reamed hole in bearing cap No. 3 and clamp.  
Right hand operation—Probe and blow out 2 holes in oil pump pad—Combination ream oil pump shaft hole.  
Left hand operation—Mill one .120 slot and one .190 slot in bearing cap No. 5.
15. Clamp: Right hand operation—Idle.  
Left hand operation—Idle.
16. Locate from reamed hole in bearing cap No. 3 and clamp.  
Right hand operation—Idle.  
Left hand operation—Mill 5 anchor slots.
17. Clamp: Right hand operation—Idle.  
Left hand operation—Idle.
18. Locate from reamed hole in bearing cap No. 3 and clamp.  
Right hand operation—Tap 2 holes in oil pump pad.  
Left hand operation—Idle.
19. Locate from reamed hole in bearing cap No. 3 and clamp each of the 5 bearing caps independently.  
Right hand operation—Idle.  
Left hand operation—Mill 4 slots through bearing cap cluster, which divides cluster into 5 separate bearing caps. (Shuttle 5 separate bearing caps to station No. 20 —).
20. Unload 5 separate bearing caps, maintaining separation.

## La Salle tool, inc.

ENGINEERING & BUILDING  
SPECIAL MACHINERY

3840 EAST OUTER DRIVE • DETROIT 34, MICHIGAN



## FORGING IN MID-AIR . . . without grips . . .

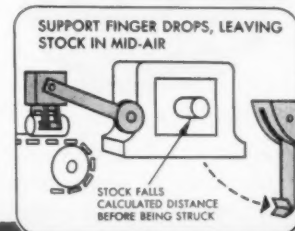
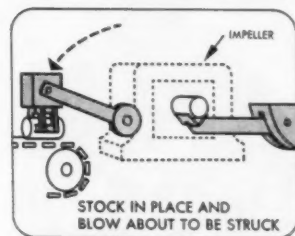
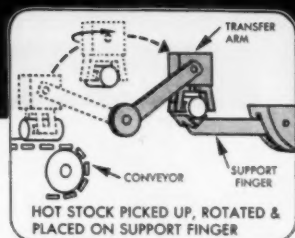
without sprues . . . without shock or vibration, *in a completely automatic operation!* This is but one of the possibilities in Cecomatic Forging based on the revolutionary Chambersburg Impacter and utilizing the Cecomatic Gravity Feed. Investigate the potentialities of the Cecomatic Process for forging production in varying degrees of automation. Write or phone us.

**CHAMBERSBURG ENGINEERING COMPANY • CHAMBERSBURG, PA.**

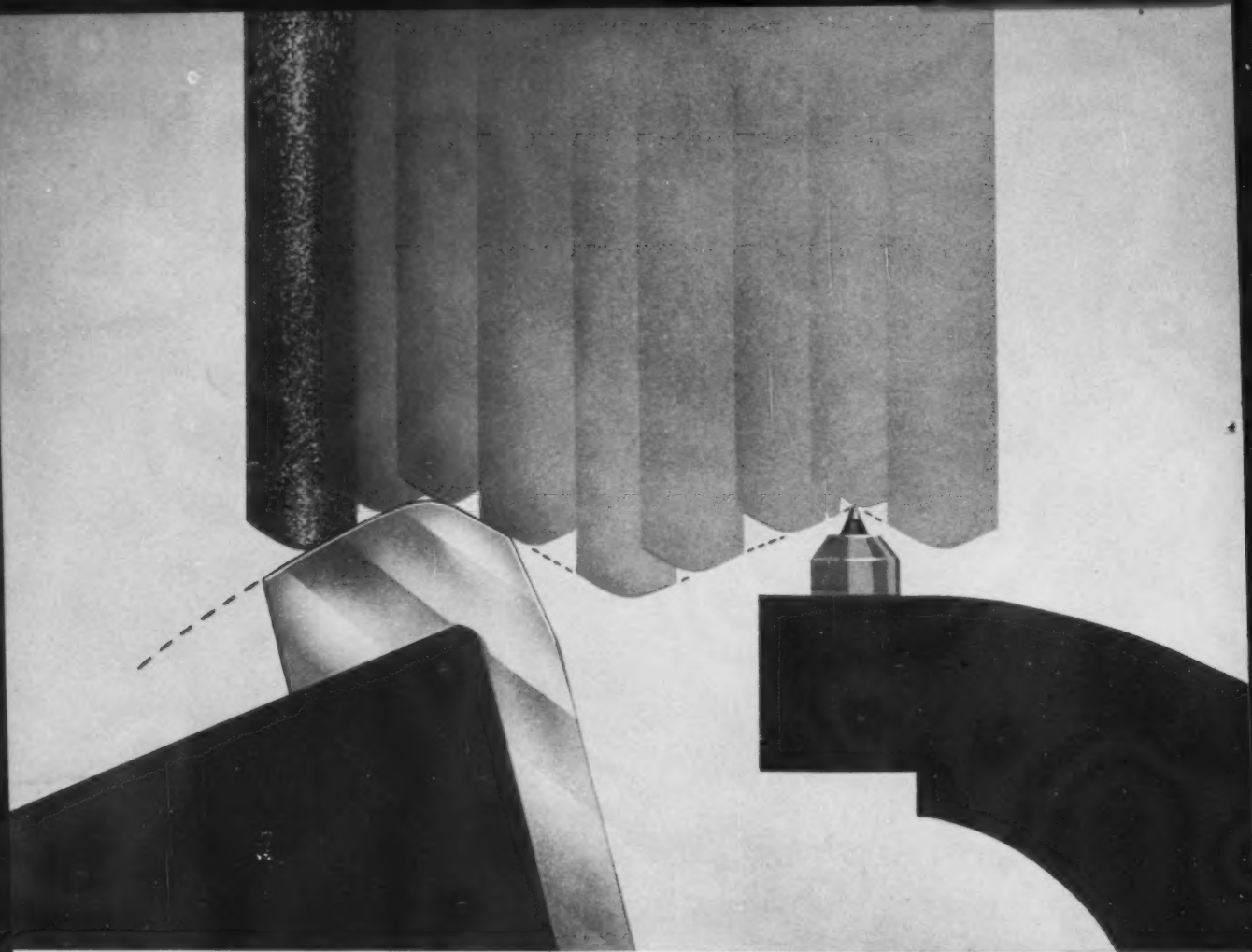
*Shockless, vibrationless forging*



*in the IMPACTER is the basis of*

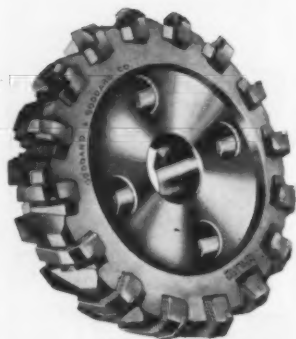


# THE CECOMATIC FORGING PROCESS



## **Oliver AUTOMATIC Face Mill Grinder**

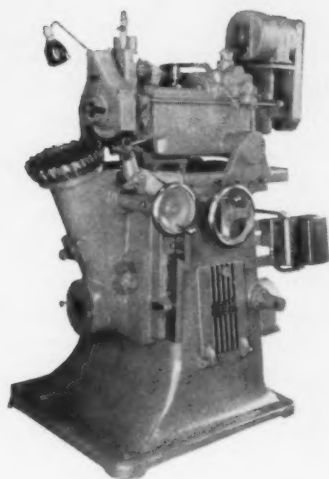
### **Wheel dressed with every stroke**



*Oliver face mill grinders are made in four sizes to accommodate cutters from 4" to 21" diameter.*

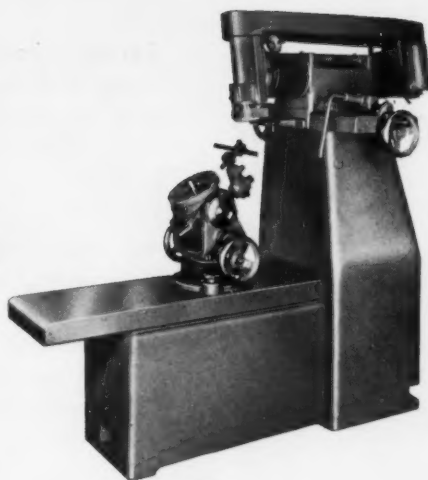
The drawing above shows the grinding wheel passing over a cutter tooth after being dressed and formed automatically by a fixed diamond. This happens with every stroke of the Oliver automatic face mill grinder. Thus, complete accuracy of grind is certain regardless of the number of teeth in the cutter. This exclusive Oliver of Adrian feature prevents loading of the wheel and also permits carbide grinding with a silicon carbide wheel. Automatic feed-down accurately compensates for each dressing thus providing a fixed grinding line.

The machine automatically indexes the cutter and controls the tooth shape by a simple cam arrangement so that any practical roughing or finishing form can be obtained. The machine grinds the corner angle, corner radius, face and dish all in one operation. Oliver's face mill grinder is hydraulically operated for smooth, fast (4 to 8 times faster per cutter), accurate and quiet performance.



### **OLIVER** Automatic FACE MILL GRINDER

... features real economy and fast, accurate grinding. One operator handles several machines. Set-up is simple. The cutter is mounted on the face plate and the automatic indexing mechanism adjusted. Required clearance is set by moving the work spindle to the desired position. All surfaces and radii are ground in one continuous operation.



### **OLIVER** General Purpose FACE MILL GRINDER

... heavy duty; for all types of face mill grinding on coarse and fine pitch cutters from 4" to 24" in diameter. All angles and clearances are instantly obtained without calculation. The cutter face, periphery and corner angles may be ground without altering the lip rest setting. The machine is completely universal.



### **OLIVER** Arc Radius GRINDER

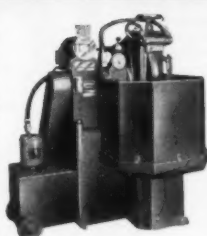
... for accurate sharpening of face mills, channel cutters, slotting cutters, etc. The face, periphery and corner radius are ground with one pass of the wheel; radius blended in perfectly. The machine will sharpen any radius up to two inches. Periphery clearance may be greater than the face. If desired, the machine will give a straight grind. High speed, diamond wheels may be used.

## More **OLIVER** of **ADRIAN** Tool Grinding Equipment



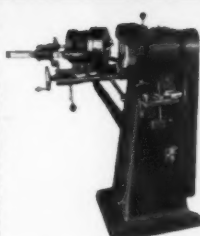
#### **ACE TOOL and CUTTER GRINDER**

Universal—grinds milling cutters, other cutting tools. Especially suited to grinding tungsten carbide.



#### **TEMPLATE TOOL BIT GRINDER**

Controlled form grinding for high speed, stellite and tungsten carbide single point tools.



#### **No. 510 DRILL POINTER**

Semi-automatic. For drills  $\frac{1}{4}$ " to 3" in diameter. No. 21 bench models available for size  $\frac{1}{2}$ " and smaller.



#### **DRILL POINT THINNER**

For low cost reclaiming of drills. Corrects off-center and too-thick webs and out-of-index cutting edges.



#### **DIE MAKING MACHINE**

Produces dies, gages, cams, templates, stripper plates, etc. at greatly reduced costs. 5 designs in 2 types.

Just check the coupon for literature on the OLIVER of ADRIAN machine you are interested in. Send it today to...



**OLIVER of ADRIAN**  
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|--|--|
| <input type="checkbox"/> Drill Pointer                           | <input type="checkbox"/> Die Making Machine        |
| <input type="checkbox"/> Face Mill Grinder                       | <input type="checkbox"/> Drill Point Thinner       |
| <input type="checkbox"/> "Ace" Universal Tool and Cutter Grinder | <input type="checkbox"/> Template Tool Bit Grinder |

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***want to check  
your  
cutter grinding  
costs?***



The Ingersoll Cutter Grinder is Standard Equipment for Low Cost Sharpening of Inserted Blade Cutters.

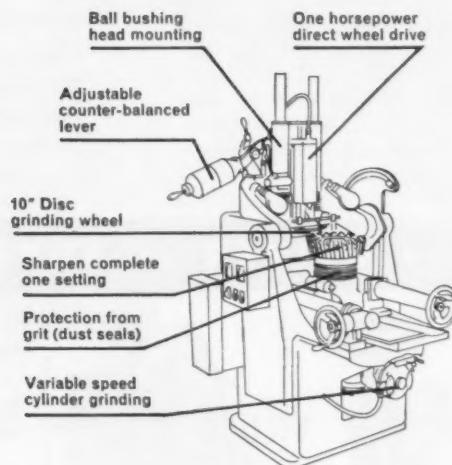
Let us resharpen one of your typical inserted blade cutters. This free demonstration, on a new Ingersoll Cutter Grinder, will tell you what you can expect to save, by replacing standard tool grinders or Ingersoll grinders of obsolete design with new Ingersoll machines.

Accurately ground cutters assure time and dollar savings, longer tool life, better tool and machine performance.

Write for shipping instructions—for a Grinding Cost Check-up.

**Ingersoll Cutter Grinder—for a money saving investment of about \$5,000<sup>00</sup> (with normal accessories)**

4" to 30" Diameter Cutters. Accuracy is assured. Grinds both periphery and face in one setting. Simple and easy to operate. Faster than Universal Grinders. Grinds a constant clearance.



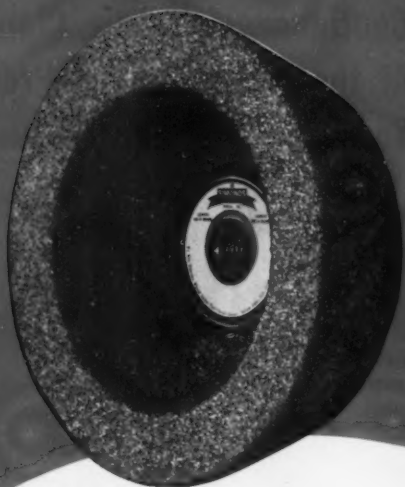
This 48-page book includes valuable grinding practice "do's and don'ts". Send for your copy today.

# CUTTER DIVISION

## THE INGERSOLL MILLING MACHINE COMPANY

ROCKFORD

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Acclaimed for NEW  
grinding efficiency

**SIMONDS**  
ABRASIVE CO.

**GRINDING WHEELS**

with **NEW IL BOND**



Hailed by industry as a major grinding wheel improvement new IL bond acts as an internal lubricant in the wheel providing the fast cutting action of a softer grade, plus the long wear of a hard wheel. For rough snagging on swing frame, floor stands and portable grinders. Write for snagging bulletin ESA 62.

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Tacony & Fraley Sts., Philadelphia 37, Pa.

Division of Simonds Saw and Steel Co.

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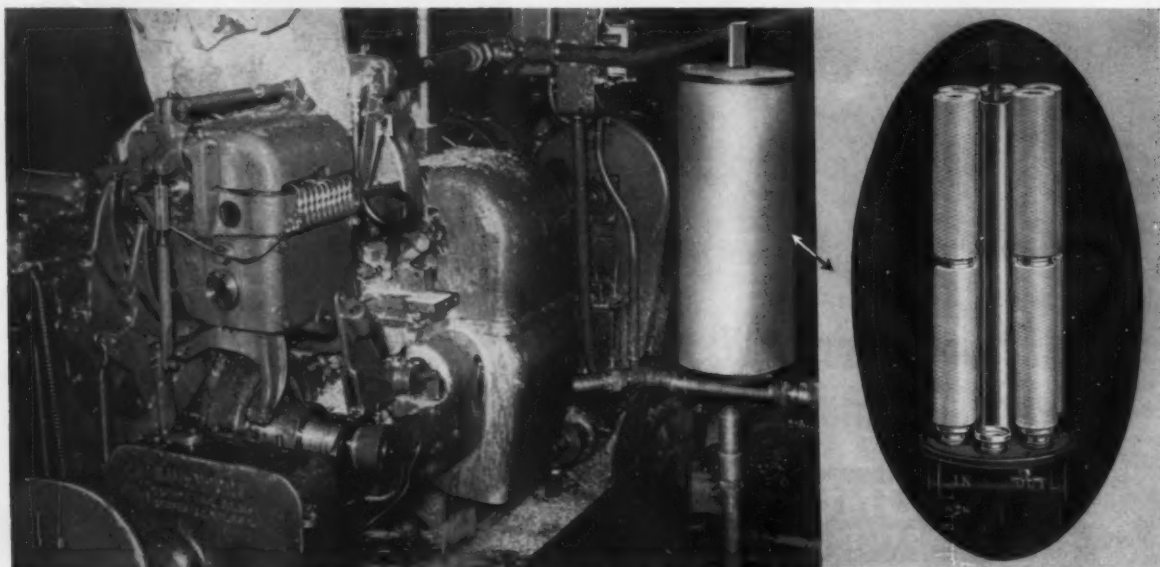
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dependable know-how  
quick supply

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FILTERS  
WHEN YOU WANT...

Continuous Micronic Clarity  
At the Flow Rate and Pressure  
Your Operations Require



Multi-Tube Fulflo Filters reduce down time by maintaining micronic clarity of coolants and cutting oils. Note simplicity of inner assembly.

## Protect Vital Equipment — Increase Production Decrease Costs

You get the exact degree of *continuous micronic clarity* you need with Fulflo Filters — for industrial fluids of all kinds: oils; liquid chemicals; water; liquid fuels; lubricating oils; lacquers; paints; thinners; compressed air; CO<sub>2</sub> and other gases; commercial fluids. A wide variety of standard models handle all normal flow rates and pressures. Special models are engineered for flow rates up to 2000 gpm or pressures as high as 5000 psi, with minimum pressure drop. With Fulflo Filters, you save money by avoiding production breakdowns, protecting machinery, parts, and products, and by keeping production flowing smoothly.

Fulflo Filters employ *genuine* Honeycomb Filter Tubes in a wide range of positively controlled densities. You have a broad selection of materials — filter elements of cotton, nylon, orlon, dacron, dynel, acetate, or glass fibre; containers of iron, steel, stainless steel, rubber-lined steel or nickel plated brass. Fulflo will not remove additives from oils. Special containers, elements or sizes can be engineered to your individual requirements.



CFC Honan-Crane Oil Filters effect substantial savings by prolonging equipment life and by extending the life of all types of oils. The CFC Multi-Cartridge Filter (illustrated at left) gives you a choice of six types of interchangeable cartridges for filtering both soluble and insoluble impurities in cutting, quenching and rolling-mill oils; turbine and vacuum pump oils; fuel and lubricating oils.

*Commercial Filters Engineers are ready to help you with any problem of fine filtration. Write for technical literature to Department MA*

*Micro-Fine Filtration  
for Low Cost Clarity*

**COMMERCIAL FILTERS CORPORATION**

MELROSE 76, MASSACHUSETTS

*Plants in Melrose, Massachusetts and Lebanon, Indiana*

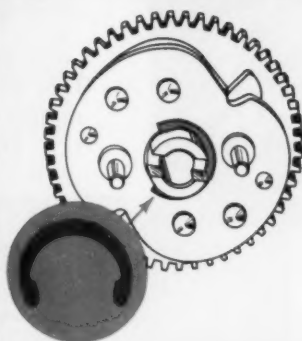


FULFLO FILTERS WITH GENUINE HONEYCOMB FILTER TUBES FOR CONTROLLED MICRONIC CLARITY • CFC MULTI-CARTRIDGE OIL FILTERS  
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AUTOMATIC TUBULAR CONVEYORS • COOLANT CLARIFIERS

## Waldes Truarc Rings speed assembly, facilitate maintenance, improve performance of new automatic calculator

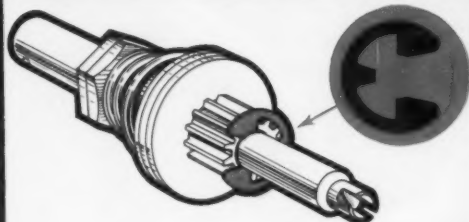


**THE NEW MARCHANT DECI-MAGIC**  
automatic-decimals calculator made by Marchant Calculators, Inc., Oakland, California.

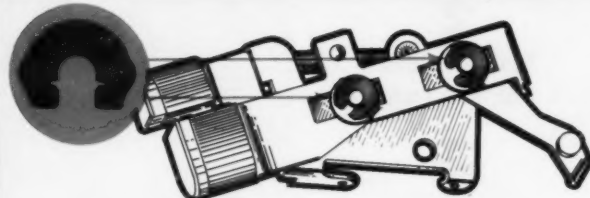


### CRESCENT RING SPEEDS ASSEMBLY, DISASSEMBLY

Main clutch utilizes radially-installed series 5103 crescent ring for rapid assembly and disassembly. Ring's low protruding shoulder provides necessary clearance between ring and the two studs. The main clutch operates each time a Deci-Magic control key is depressed.



**E-RING SECURES PARTS AGAINST SPRING THRUST.** Slip clutch assembly uses Truarc series 5133 E-ring to hold parts on shaft. Functioning of the assembly is dependent upon the ring's ability to withstand thrust exerted by the heavy barrel spring.



**LOCKING PRONG RINGS PERMIT SIMPLE DESIGN.** Shift slide assembly uses two Truarc series 5139 bowed locking prong rings to lock the parts together in a sliding fit. Precise amount of spring tension prevents objectionable wobble and noise, permits the key to slide smoothly in operation. Easy radial assembly and disassembly of rings facilitates field maintenance and repair. Alternative construction would have required cut washer, spring washer and hairpin-type spring clip on each stud.

Whatever you make, there's a Waldes Truarc Ring designed to save you material, machining and labor costs, and to improve the functioning of your product.

In Truarc, you get

**Complete Selection:** 36 functionally different types. As many as 97 standard sizes within a ring type. 5 metal specifications and 14 different finishes. All types available quickly from leading OEM distributors in 90 stocking points throughout the U.S. and Canada.

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**Field Engineering Service:** More than 30 engineering-minded factory representatives and 700 field men are at your call.

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**TRUARC**<sup>®</sup>  
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Please send new, descriptive catalog showing all types of Truarc rings and representative case history applications. (Please print)

Name .....  
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City ..... Zone ..... State ..... M109

WALDES TRUARC Retaining Rings, Grooving Tools, Pliers, Applicators and Dispensers are protected by one or more of the following U. S. Patents: 2,382,948; 2,411,426; 2,411,761; 2,416,852; 2,420,921; 2,428,341; 2,439,785; 2,441,846; 2,455,165; 2,483,379; 2,483,380; 2,483,383; 2,487,802; 2,487,803; 2,491,306; 2,491,310; 2,509,081; 2,544,631; 2,546,616; 2,547,263; 2,558,704; 2,574,034; 2,577,319; 2,595,787, and other U. S. Patents pending. Equal patent protection established in foreign countries.





Geargrind machines like this turn out gears up to 36" in diameter.

## 4-WAY

# Versatility

TO FINISH GRIND GEARS, SPLINES  
AND SPECIAL CONTOUR PARTS  
TO YOUR REQUIRED TOLERANCES

### 1 ROUGHING GRIND

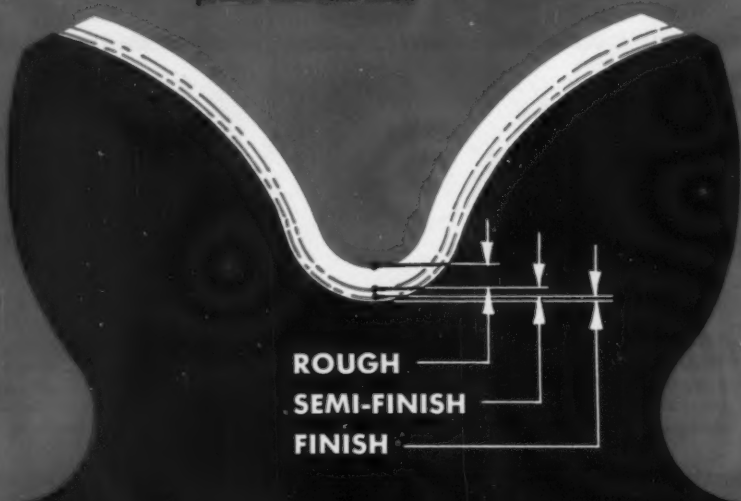
### 2 ROUGH GRIND FINISH GRIND

### 3 ROUGH GRIND SEMI-FINISH GRIND FINISH GRIND

### 4 MANUAL GRIND

Choose from any of the above four methods (with selective feed increments) depending on your requirements.

Single or double diamond trimmers assure perfect blend of tooth profile and root fillet.



57MT-A

Besides the exceptional versatility illustrated above, Geargrind machines deliver high productivity and accuracy. Over 10 years ago, design engineers at Geargrind tackled the job of building a machine to grind gear teeth to the finest quality at the highest possible production rate. Finished product of this effort is today's Geargrind machine. Geargrind machines now offer outstanding performance in all types of aircraft, automotive and industrial applications.

#### ALL GEARGRIND MACHINES:

- Perform operations never before possible
- Save valuable time
- Decrease the need for skilled operators
- Increase production rates
- Offer unmatched combination of features

#### WRITE FOR LITERATURE

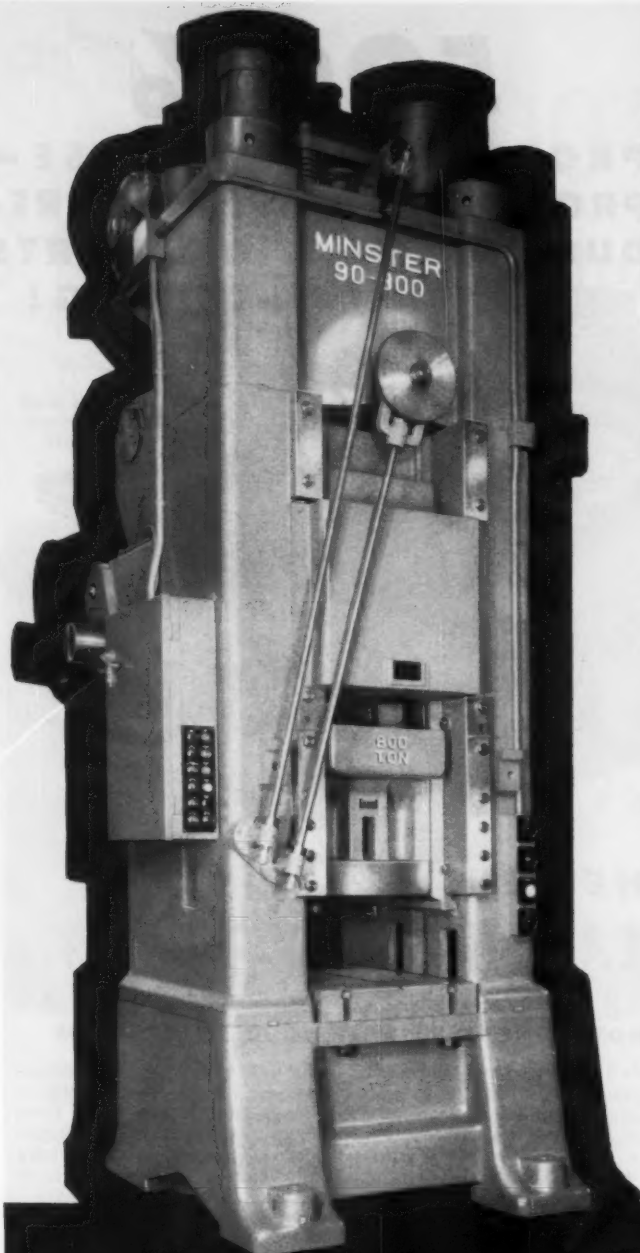
The entire Geargrind story is covered in this illustrated brochure. Send today for your free copy.



#### THE GEAR GRINDING MACHINE COMPANY

3921 Christopher, Detroit 11, Michigan

MANUFACTURERS OF: THE DETROIT SCREWMATIC 750, AUTOMATIC SCREW MACHINE RZEPPA ("SHEPPA") CONSTANT VELOCITY UNIVERSAL JOINTS



**These Outstanding  
Features Make**

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## **KNUCKLE JOINT PRESSES**

### **More Productive**

- The Precision Built into the Press Gives You Greater Parts Accuracy—Longer Press Life
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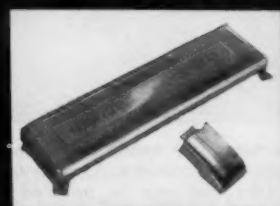
**SIZING**



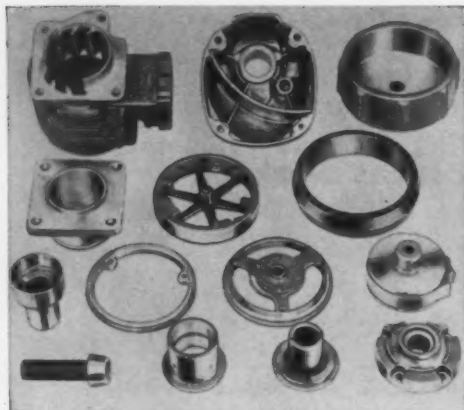
**COINING**



**EMBOSSING**



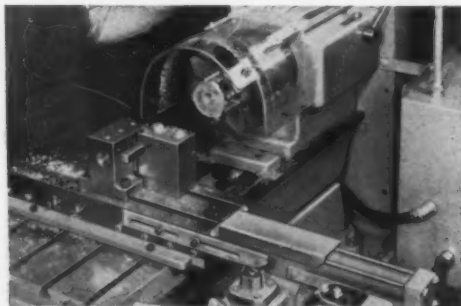
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MINSTER, OHIO



If your operations call for turning, boring, facing, forming, grooving, chamfering, beveling, or cut-off of parts such as these (pieces shown merely suggest the almost endless variety), there's a CLAUSING Hydra-Cycle for handling these operations in combination or singly, with great speed, to close tolerances, and at low cost.



All the operator has to do is load the machine, press a button, take out the machined piece seconds later. The Hydra-Cycle does the rest, automatically.



Six surfaces are being machined in the operation shown above. As is the case with most jobs that can be handled by the Hydra-Cycle, the tooling required is simple, inexpensive.

# 500%

## PRODUCTION INCREASE— PROPORTIONATE COST RE- DUCTION IN SMALL PARTS MACHINING!



MODEL 6405  
4 Operating  
CYCLES

SEE THEM AT THE  
NATIONAL METAL  
EXPOSITION,  
CHICAGO, ILLINOIS,  
NOVEMBER 4-8,  
BOOTH 1350

### THE NEW CLAUSING SEMI-AUTOMATIC BORING AND TURNING MACHINE 4 MODELS—ONE TO MEET YOUR EXACT NEEDS

Users report production increases of 200% to 500%, with corresponding cost reduction, and jobs have been held to .0002 tolerance on production runs. Average job change and set-up takes from 15 to 30 minutes. No special jigs or fixtures required . . . simple block tool holders, carbide insert bits and standard boring bars will handle most jobs. Operator merely loads, presses starter button, and unloads finished pieces *seconds later* . . . machining operations are performed automatically . . . simultaneously or in continuous sequence. A time and money saver on short as well as long production runs.

SPECIFICATIONS: 5" x 16" cross slide with 4-11/16" swing, 5" travel; 12" x 14" table with 9" swing, 8" travel. Prices start at \$4250 with electricals and hydraulic equipment installed.

**NO  
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OFFER!**

Simply send us complete data . . . drawings of rough and finished part, indicating material, tolerances, finish required, production rate—and, samples of finished and unfinished parts. Our engineering department will gladly make recommendations for the use of the Hydra-Cycle model best suited to your requirements. No obligation. Mail to Hydra-Cycle Department, Clausing Division, Atlas Press Company, Kalamazoo, Michigan.

# CLAUSING

## CLAUSING DIVISION ATLAS PRESS COMPANY

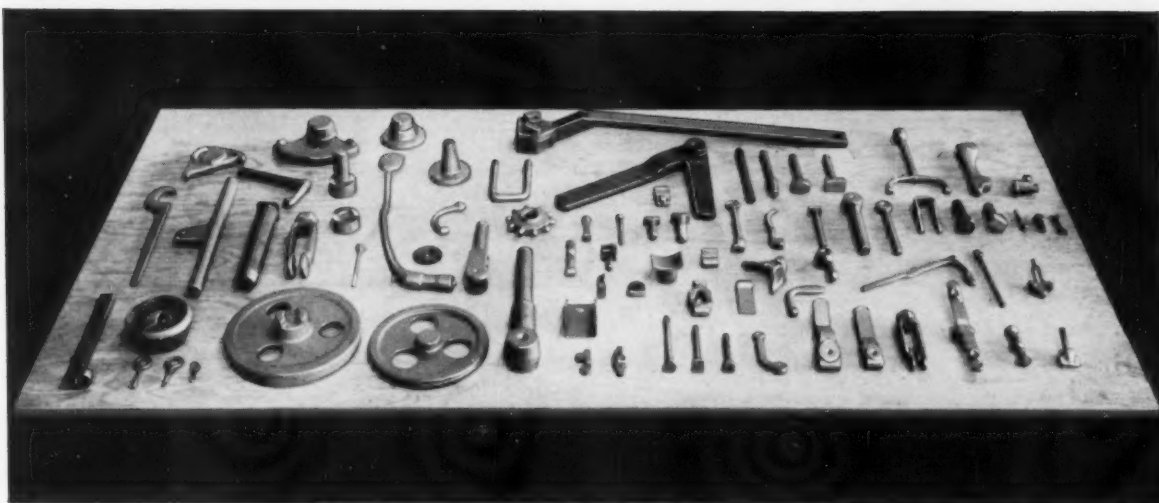
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# 200 Different Parts Heated for Forging-

Better, Faster and at Much Lower Cost

with **TOCCO**\* Induction Heating



• When progressive production people at General Railway Signal Company installed a 200 kw, 3000 cycle TOCCO machine, they were able to eliminate 7 slot-type oil-fired furnaces and produce better forgings than ever before—at substantially lower costs.

**Cost Down**—Fuel costs have been reduced from \$15.26 to \$1.60 per hour with TOCCO. Expensive furnace lining maintenance has been eliminated, and straightening and reheating operations formerly required are no longer necessary.

With oil-fired furnaces all steam hammer operators needed helpers. With TOCCO most of these helper operations have been eliminated.

TOCCO's fast, automatic operation produces almost no scale and achieves uniform temperatures throughout the entire cross section—improving the quality of the forgings and providing increases of up to 40% in the life of the forging dies.

Overall production costs in the forge shop at G.R.S. have been reduced an impressive 35%!

**Flexibility**—Production runs at G.R.S. range from a low of 15 pieces to a high of over 50,000. Parts from ½ pound to over 25 pounds are heated, merely by changing inductor coils and power control settings.

**Better Working Conditions**—TOCCO makes the forge shop a better place to work by doing away with noise, dust, dirt, smoke and radiant heat and gases produced by old fashioned furnaces.

If you're looking for a way to produce similar results in your plant, it will pay you to consult a TOCCO Engineer.



## TOCCO

THE OHIO CRANKSHAFT COMPANY

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Please send copy of "Typical Results of TOCCO Induction Heating for Forming and Forging".

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# Now! A Complete Line of Self-Locking Microsize UNBRAKO Socket Cap and Set Screws

Nos. 0, 1, 2 and 3 in alloy steel and stainless steel  
are available with the Nylok\* feature

You effect major economies in time and money when you design and assemble small devices with self-locking microsize UNBRAKO socket screws. These close tolerance screws won't work loose. They simplify standardization of small devices where maximum reduction of weight is required without sacrifice of strength. They eliminate the necessity of designing costly special screws to fasten tiny parts in compact assemblies and they prevent the waste of production time while waiting for delivery of special screws.

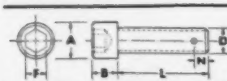
In addition to having the overall advantages of microsize UNBRAKO socket screws, these screws can be used in holes tapped in soft or die cast materials without stripping threads and ruining expensive work. Also the set screws can be used with hardened shafts, since they lock against the threads of the tapped hole.

All UNBRAKO socket screws can be supplied with the self-locking Nylok feature. The UNBRAKO with Nylok is a single self-locking unit. No auxiliary locking devices are needed. Seated or not, the screw locks positively wherever wrenching stops, won't work loose—because the tough resilient nylon pellet forces mating threads together.

Ask your authorized industrial distributor for details today. He carries complete stocks of self-locking UNBRAKO socket screws (caps and sets from #0 through 1 in., button heads #4 through 3/8 in., flat heads from #4 through 3/4 in.). Or write us for literature and samples. Unbrako Socket Screw Division, STANDARD PRESSED STEEL Co., Jenkintown 19, Pa.

\*T.M. Reg. U.S. Pat. Off., The Nylok Corporation

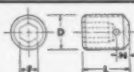
*We also manufacture precision titanium fasteners. Write for free booklet.*



**HEAT-TREATED ALLOY STEEL  
Self-Locking Microsize UNBRAKO  
Socket Cap Screws  
Class 3A Threads**

Screw Size	Threads per in.		L Over-all Length	N Pellet Location		Torque		
	NC	NF		NC	NF	Max. prev. on	1st off stat. min.	5th off stat. min.
# 0	A .104	80	1/8	—	.047	5.5	14.0*	7.0*
	B .060	80	3/8	—	.047	5.5	14.0*	7.0*
	D .060	80	1/2	—	.047	5.5	14.0*	7.0*
	F .050	80	3/4	—	.047	5.5	14.0*	7.0*
# 1	A .118	72	1/8	—	.047	11.0	28.0*	14.0*
	B .073	72	3/8	—	.047	11.0	28.0*	14.0*
	D .073	72	1/2	—	.047	11.0	28.0*	14.0*
	F .050	72	3/4	—	.047	11.0	28.0*	14.0*
# 2	A .140	56	1/8	.063	—	24.0	3.0	1.5
	B .086	56	1/4	.063	—	24.0	3.0	1.5
	D .086	56	3/8	.063	—	24.0	3.0	1.5
	F 1/16	56	1/2	.063	—	24.0	3.0	1.5
# 3	A .161	48	1/8	.063	—	40.0	6.5	3.0
	B .099	48	1/4	.063	—	40.0	6.5	3.0
	D .099	48	3/8	.063	—	40.0	6.5	3.0
	F 3/64	48	1/2	.063	—	40.0	6.5	3.0

\*Measured in in.-gm. (those not marked with a star are measured in in.-oz.)



**HEAT-TREATED ALLOY STEEL  
Self-Locking Microsize UNBRAKO  
Socket Set Screws  
Class 3A Threads**

Screw Size	Threads per in.		L Over-all Length	N Pellet Location		Torque		
	NC	NF		NC	NF	Max. prev. on	1st off stat. min.	5th off stat. min.
# 0	D .060	80	1/8	—	.047	5.5	14.0*	7.0*
	F .028	80	1/4	—	.047	5.5	14.0*	7.0*
		80	3/8	—	.047	5.5	14.0*	7.0*
		80	1/2	—	.047	5.5	14.0*	7.0*
# 1	D .073	72	1/8	—	.062	11.0	28.0*	14.0*
	F .035	72	1/4	—	.062	11.0	28.0*	14.0*
		72	3/8	—	.062	11.0	28.0*	14.0*
		72	1/2	—	.062	11.0	28.0*	14.0*
# 2	D .086	56	1/8	.062	—	24.0	3.0	1.5
	F .035	56	1/4	.062	—	24.0	3.0	1.5
		56	3/8	.062	—	24.0	3.0	1.5
		56	1/2	.062	—	24.0	3.0	1.5
# 3	D .099	48	1/8	.093	—	40.0	6.5	3.0
	F .050	48	1/4	.093	—	40.0	6.5	3.0
		48	3/8	.093	—	40.0	6.5	3.0
		48	1/2	.093	—	40.0	6.5	3.0

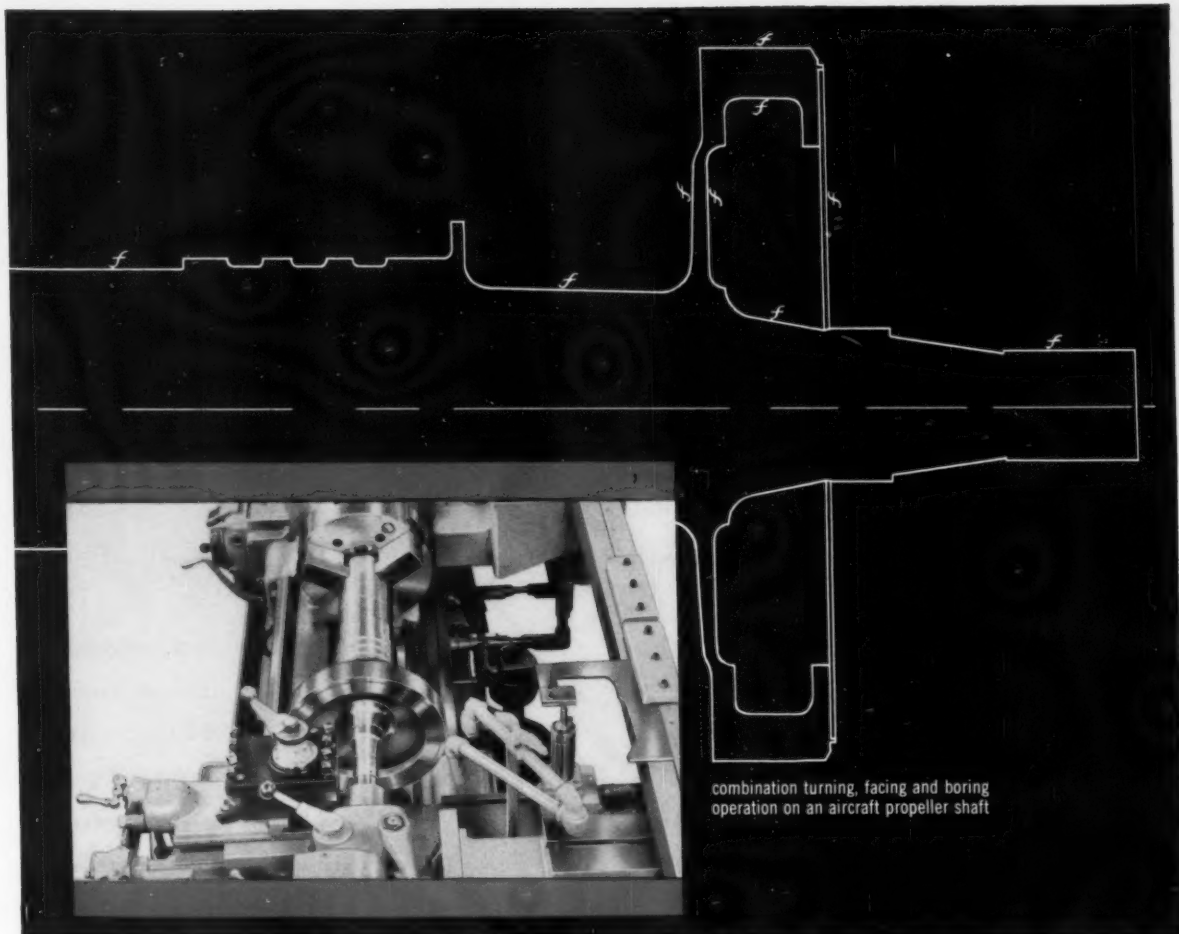
\*Measured in in.-gm. (those not marked with a star are measured in in.-oz.)

Self-locking microsize UNBRAKO socket cap and set screws are available in sizes #0 through #3, in heat treated alloy steel (plated or unplated) and stainless steel, at your authorized industrial distributor. He also carries a complete stock of other self-locking UNBRAKO socket screws.

**SPS**

**Jenkintown • Pennsylvania**

Standard Pressed Steel Co. • The Cleveland Cap Screw Co. • Columbia Steel Equipment Co., Inc. • Cooper Precision Products • Standco Canada Ltd. Unbrako Socket Screw Co., Ltd.



combination turning, facing and boring  
operation on an aircraft propeller shaft

Duplicate complex curves... quickly... easily... with the Lodge & Shipley

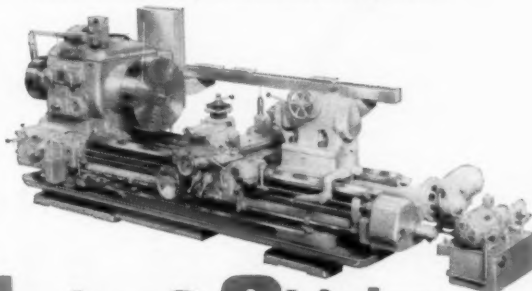
# DUAL TRACER

lathe and all-hydraulic 360° control

The machining of complex contours on the periphery, bore or face of a workpiece is the job for which the Lodge & Shipley DUAL TRACER was perfected. In addition to this facility, the DUAL TRACER can handle conventional tracing jobs or can be changed over almost instantly to standard lathe operation. This versatility removes the DUAL TRACER from the limited use that makes the "special lathe" an uncertain investment.

Chances are the DUAL TRACER can do your job faster and more economically. Consult our

sales engineering department. For details, write: The Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.



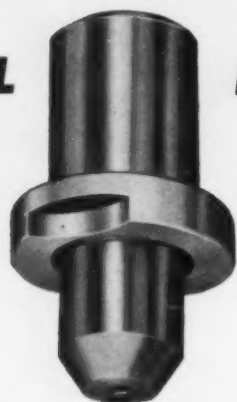
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RIGHT ON THE NOSE!

WITH UNIVERSAL

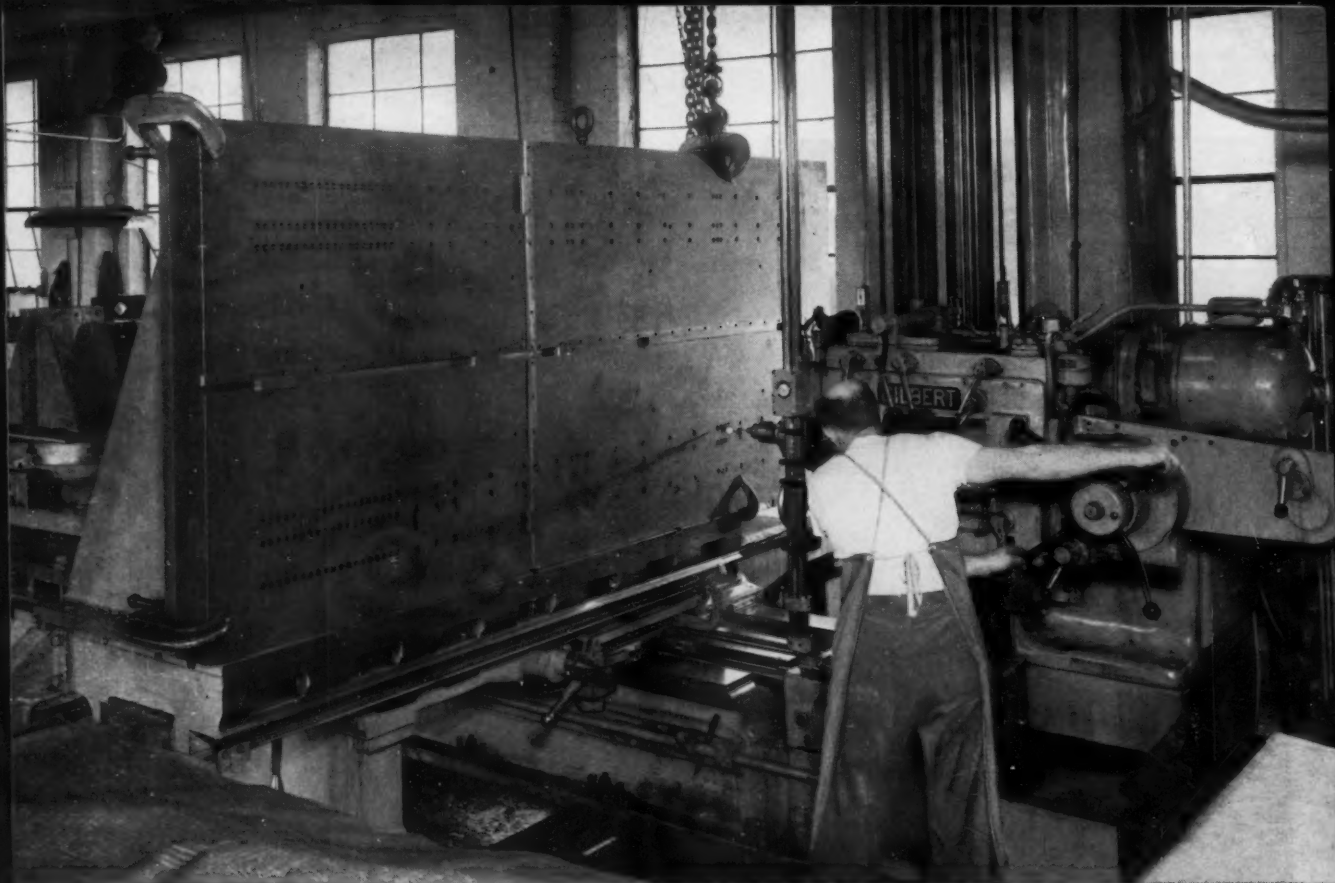
LOCATING  
PINS



The accuracy of Universal Locating Pins assures you quick, accurate alignment in production operations. They are hardened and ground and held to close tolerances. All standard sizes—of round or relieved—in press fit, threaded or lock screw types including rest buttons are stocked and available for immediate delivery at a fraction of the cost of ordinary tool-room pins. Write today for new 98 page catalog showing the complete line of Universal quality products.

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ENGINEERING  
COMPANY**

FRANKENMUTH 2,  
MICHIGAN



*courtesy Linden Tool and Manufacturing Co.*

## Linden's Gilbert holds 235 holes on location $\pm .0007''$

This is the kind of job you can handle profitably if you have a good operator and a Cincinnati Gilbert horizontal boring mill.

The piece is a 50" by 120" base for special indexing. Linden Tool and Manufacturing Co., Dayton, O., performs these operations:

1. Mill keyways  $\frac{9}{32}''$  deep, full length and width of the base. Width of each keyway is  $1.000'' \pm .001''$ .
2. Drill 235 indexing holes,  $.625''$  diameter. These holes must be held on location within  $\pm .0007''$ . In addition, center lines of the holes (horizontal and vertical) must be parallel and square with the key-ways within  $.001''$ .

This job is another demonstration of the excep-

tional rigidity of Gilbert boring mills. Extended table and saddle supports help to maintain accuracy and handle the workpiece. Linden Tool and Manufacturing Company uses two Gilberts to produce a broad range of quality work for its Dayton area customers.

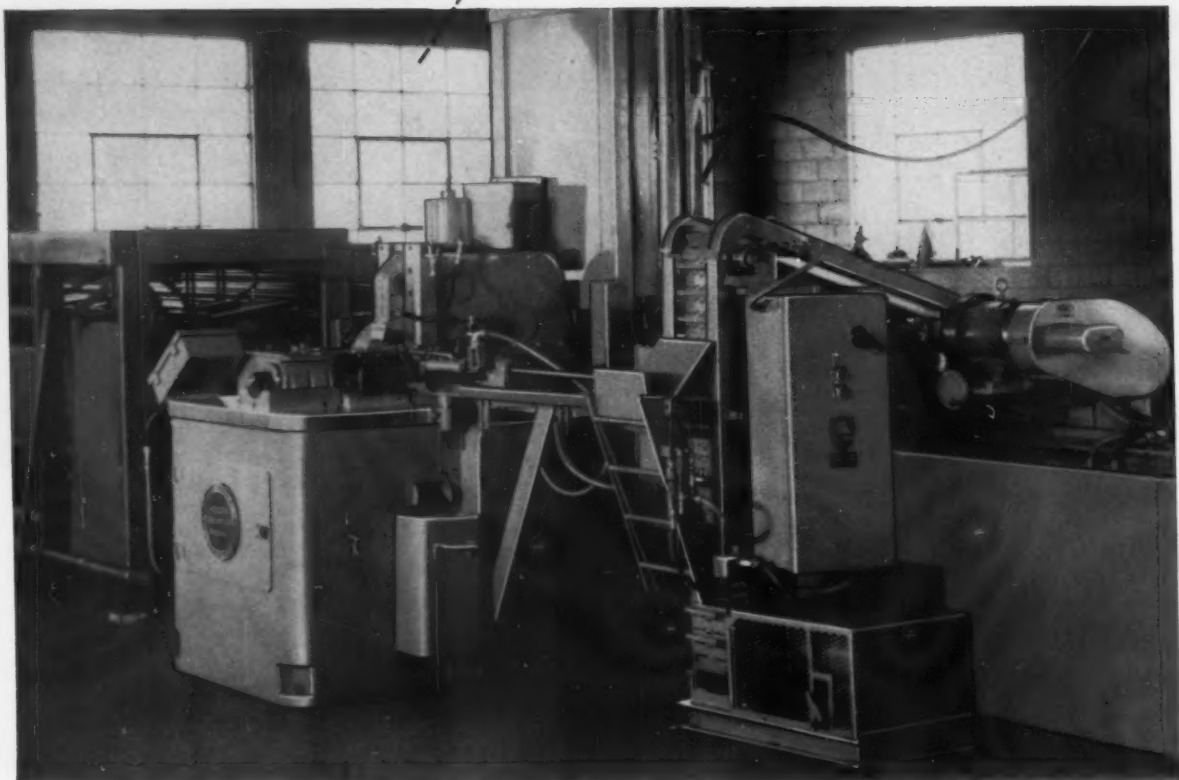
Gilbert boring mills are built as both Table and Floor types, with spindle diameters of  $3\frac{1}{2}''$ ,  $3\frac{3}{4}''$ , 4", and 5". A selection of column heights, bed lengths, table sizes, and workholding units makes them easily adaptable to your requirements. Add to your work capacity—and your machining dollars—by getting a proposal from Gilbert now. *The Cincinnati Gilbert Machine Tool Co. 3346 Beekman Street, Cincinnati 23, Ohio*

*those who buy Gilbert buy* **GILBERT** *again*



**One Grieder Tube  
Cut-off Machine Is  
Producing...**

**2400 Crankcase Filler  
Tubes Per Hour For A Major  
Automobile Manufacturer**



**Tube Specifications**

Mechanically welded 1 3/4" OD, .035" wall thickness, mild steel supplied in 22' lengths. Cut off in lengths of 9.070" plus or minus .002" with both ends finished burr free.

The Grieder Tube Cut-off Machine cycling at the low end of its 4500 to 6000 pieces per hour rate runs intermittently. Production on this application is limited by the cycling rate of the special end finishing machine to which it is coupled. This complete line of machinery is electrically interlocked for automatic operation.

Grieder Tube Cut-off Machines are made in three sizes to accommodate tubes of any shape from 3/16" to 4" OD. Hoppers for automatic feeding of tubes are available as extra equipment.

Write for literature.

**GRIEDER INDUSTRIES, INC.**

P. O. BOX 169, BOWLING GREEN, OHIO





This is a typical boring set-up. Counterboring and trepanning tools give equally efficient results.

**SHELL GARIA OIL 115**  
specified for

## **LeBLOND-CARLSTEDT RAPID BORER**

*... the machine that produces deep holes 3 to 8 times faster*

The manufacturers of this new concept in deep hole boring say that the Rapid Borer was developed expressly to accommodate revolutionary new tooling which drills, bores and trepans at high speed with accuracy, and gives excellent finish. Cutting oil is forced between the boring bar and wall of stock, forming a continuous bearing. The oil is forced back through a hollow boring bar, carrying away the chips as it goes. Tool faces are kept clean and chip passage clear. Chips do not come in contact with finished bore.

To insure the success of this operation, a special cutting oil with extreme pressure and excellent cooling characteristics was required. Shell Research went to work, and out came a new addition to the Shell family of cutting oils . . . Garia® Oil 115.

If you are interested in more technical information on Garia Oil 115, write Shell Oil Company, 50 West 50th Street, New York 20, N. Y., or 100 Bush Street, San Francisco 6, California.

**SHELL GARIA OIL 115**



# Product Directory

To find headings easily, look for capital letters at top of each page to denote location.

## ABRASIVE CLOTH, Paper and Belt

Crane Packing Co., Morton Grove, Ill.

Gardner Machine Co., Beloit, Wis.  
Norton Co., 1 New Bond St., Worcester, Mass.  
Simonds Abrasive Co., Tacony and Fraley Sts.,  
Bridesburg, Philadelphia, Pa.

Norton Co., 1 New Bond St., Worcester 6,  
Mass.  
Simonds Abrasive Co., Tacony and Fraley Sts.,  
Bridesburg, Philadelphia, Pa.

## ABRASIVES, Disc

Carborundum Co., Niagara Falls, N. Y.  
Delta Power Tool Div., 400 N. Lexington Ave.,  
Pittsburgh 8, Pa.

## ABRASIVES, Polishing, Tumbling, Etc.

Crane Packing Co., Morton Grove, Ill.

## ACCUMULATORS, Hydraulic

Watson-Stillman Co., Roselle, N. J.

## AIR GAGES, Dimensional—See Gages Air Comparator

## AIR GUNS

Chicago Pneumatic Tool Co., New York 17,  
N. Y.  
Schrader's Sons, A., 470 Vanderbilt Ave.,  
Brooklyn 38, N. Y.

## AIR TOOLS—See Grinders, Portable, Pneumatic —Drills, Portable, Pneumatic, Etc.

## ALLOY STEELS

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.  
Bethlehem Steel Co., Bethlehem, Pa.  
Carpenter Steel Co., Reading, Pa.  
Columbia Tool Steel Co., Chicago Hts., Ill.  
Crucible Steel Co. of America, Oliver Bldg.,  
Pittsburgh 30, Pa.  
Ryerson Joseph T., & Son, Inc., 2558 W. 16th  
St., Chicago 18, Ill.  
U. S. Steel Corp., Carnegie-Illinois Steel Corp.  
Div., 436 7th Ave., Pittsburgh, Pa.  
Vanadium Alloys Steel Co., Latrobe, Pa.  
Wheelock, Lovejoy & Co., Inc., Cambridge,  
Mass.

## ALLOYS, Bearing

Bunting Brass & Bronze Co., 715 Spencer,  
Toledo 1, Ohio  
Carpenter Steel Co., 105 W. Bern St., Reading,  
Pa.  
Crucible Steel Co. of America, Henry W. Oliver  
Bldg., Mellon Square, Pittsburgh 22, Pa.  
Mueller Brass Co., Port Huron, Mich.

## ALLOYS, Non-ferrous—See Brass, Cop- per, Zinc and Stellite

## ALUMINUM and Aluminum Products

Mueller Brass Co., Port Huron, Mich.  
Revere Copper & Brass, Inc., 230 Park Ave.,  
New York 17, N. Y.  
Ryerson & Son, Jos. T., 16th & Rockwell Sts.,  
Chicago 8, Ill.

## ANGLE PLATES—See Set-Up Equipment

## ANNEALING FURNACES

Eisler Engrg. Co., 750 So. 13th St., Newark 3,  
N. J.  
General Electric Co., Schenectady, N. Y.  
Holcroft & Co., 6545 Epworth Blvd., Detroit  
10, Mich.

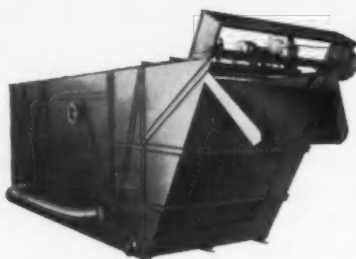
# 1,000 G.P.M. Micronic Filtration

THE



## Filter-Matic *Tubular Screen* VACUUM FILTER

You get micronic filtration at high flow rates in the compact Delpark Filter-Matic. Designed for minimum space, the Filter-Matic combines highly efficient filtering elements with fully automatic self-cleaning mechanisms. The filtering elements are permanent and eliminate the usual expense of filter media. Clean coolant flow from the filter is not interrupted during the cleaning cycle. Requires minimum attention. Capacities range from 5 G.P.M.



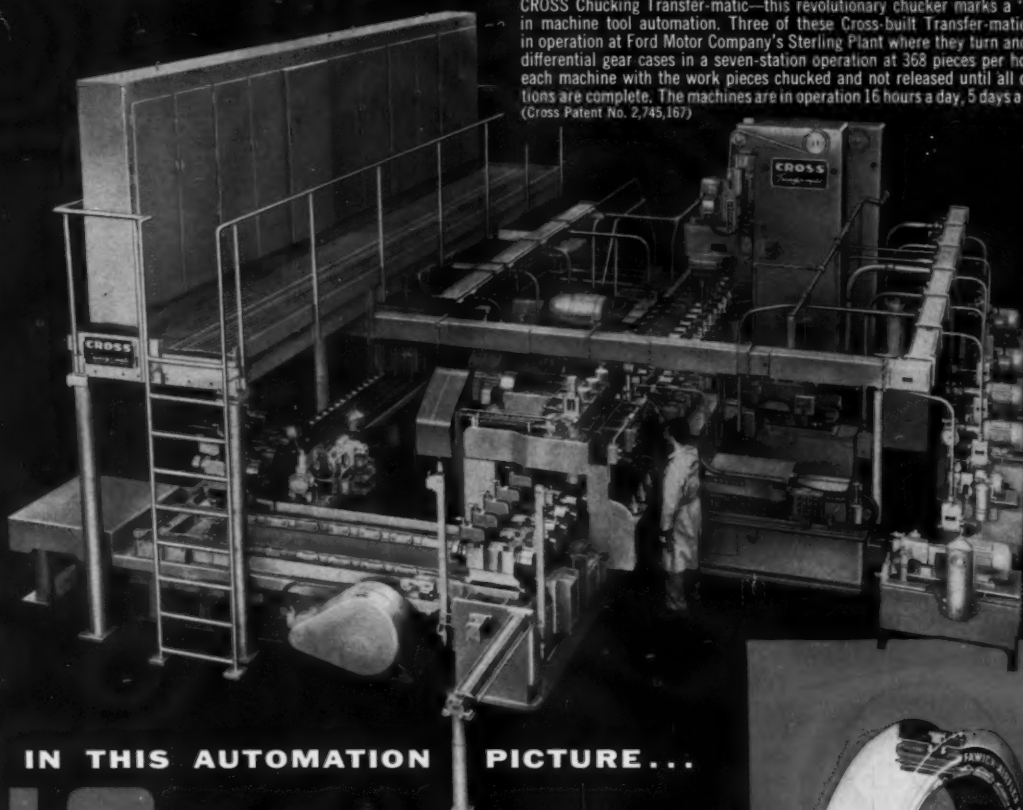
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8 page bulletin on  
Filtration for Industry

... FIRST in Filtration Advancement



INDUSTRIAL FILTRATION COMPANY  
15 INDUSTRIAL AVENUE  
LEBANON, INDIANA

CROSS Chucking Transfer-matic—this revolutionary chucker marks a "first" in machine tool automation. Three of these Cross-built Transfer-matics are in operation at Ford Motor Company's Sterling Plant where they turn and bore differential gear cases in a seven-station operation at 368 pieces per hour on each machine with the work pieces chucked and not released until all operations are complete. The machines are in operation 16 hours a day, 5 days a week. (Cross Patent No. 2,745,167)



IN THIS AUTOMATION PICTURE...

# 16 Fawick Clutches making power behave

FAWICK Clutches are vital components of these machines. A total of 16 model CB Airflex units provide the critical power control necessary to the precision automatic operation of each Chucking Transfer-matic. Here is what FAWICK Airflex Clutches offer:

- ▶ instant response
- ▶ lifetime "new-clutch" action
- ▶ full-power transmission
- ▶ greater safety
- ▶ freedom from maintenance

FAWICK Clutches are used in these and many other automatic machines because of their outstanding performance—proof again of FAWICK leadership in *making power behave*! Discover the outstanding advantages of FAWICK power control products today. Call or write the home office or your nearby FAWICK representative.

**FAWICK AIRFLEX DIVISION**  
**FAWICK CORPORATION**  
 9919 Clinton Road • Cleveland 11, Ohio  
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CB Airflex Clutch: For high speed cyclic or continuous operation . . . needs no lubrication . . . adjusts automatically for wear of friction shoes.

**FAWICK** *Airflex*  
**INDUSTRIAL CLUTCHES AND BRAKES**



# You'll Win on one of these numbers

**A FEW PIECES**  
—at Experimental  
or Pilot Stage

# 1

**SHORT RUNS**

# 2

**PRODUCTION  
RUNS**

# 3

## And you can't win unless all three are available

Our ability to use the *best of three* stamping techniques, each our own exclusive development, assures lowest possible cost on any quantity—one to a million or more.

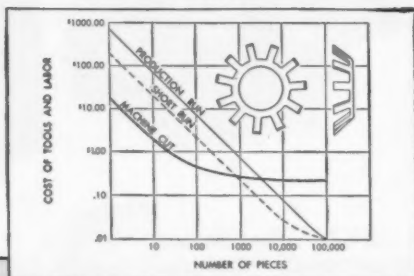
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To produce something more than a few, but less than high production quantities, our simple contour dies—PLUS special purpose presses—keep costs low.

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Chicago-Latrobe, 411 W. Ontario St., Chicago  
10, Ill.  
Cleveland Twist Drill Co., 1242 E. 49th St.,  
Cleveland, Ohio  
Jacobs Mfg. Co., West Hartford, Conn.  
Kearney & Trecker Corp., Milwaukee 14, Wis.  
Logansport Mch. Co., Inc., Logansport, Ind.  
South Bend Lathe Wks., South Bend 22, Ind.  
Wesson Co., 1220 Woodward Heights Blvd.,  
Ferndale, Mich.  
Whitman & Barnes, 40600 Plymouth Rd.,  
Plymouth, Mich.

**ARC WELDERS**—See Welding Equipment, Arc

#### ASSEMBLING MACHINES

Ingersoll-Rand Co., 11 Broadway, New York 4,  
N. Y.  
Robbins, Omer E. Co., 24800 Plymouth Rd.,  
Detroit 39, Mich.

**AUTOMATIC SCREW MACHINES**—See  
Screw Machines, Single- and Multiple-  
Spindle Automatic

#### AUTOMATION EQUIPMENT

Wilson Automation, P.O. Box 3855, Detroit 5,  
Mich.

#### BABBITT

Ryerson, Jos. T. & Son, 2558 W. 16th St.,  
Chicago 18, Ill.

#### BALANCING EQUIPMENT

Gisholt Machine Co. (Static and Dynamic),  
1245 E. Washington Ave., Madison 10,  
Wis.  
LaSalle Tool, Inc., 3840 E. Outer Dr., Detroit  
34, Mich.  
Orban Kurt Co., Inc., 42 Exchange Place, Jersey  
City 2, N. J.  
Sundstrand Mach. Tool Co., 2531 11th St.,  
Rockford, Ill.

#### BALL-MAKING MACHINES

New Departure Div., Bristol, Conn.

#### BALLS

Haynes Stellite Co., Kokomo, Ind.  
Kennametal Inc., Latrobe, Penna.

**BAR MACHINES**—See Screw Machines,  
Single- and Multiple-Spindle, Auto-  
matic

#### BAR STOCK, Non-ferrous

American Crucible Prod. Co., Port Huron,  
Mich.  
Bunting Brass & Bronze Co., 715 Spencer,  
Toledo, Ohio  
Centrifugally Cast Products Div., Shenango  
Furnace Co., Dover, Ohio  
Mueller Brass Co., Port Huron, Mich.  
Ryerson, Jos. T. & Son, 2558 W. 16th St.,  
Chicago 18, Ill.

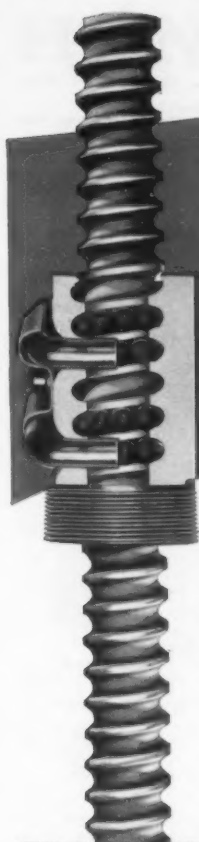
#### BAR STOCK AND SHAFTING, Steel

Bethlehem Steel Co., 701 East Third St.,  
Bethlehem, Pa.  
Boston Gear Works, 14 Hayward St., Quincy  
71, Mass.  
Carpenter Steel Co., 105 W. Bern St., Reading,  
Pa.  
Crucible Steel Co. of America, Henry W.  
Oliver Bldg., Mellon Sq., Pittsburgh 22, Pa.  
Cumberland Steel Co., Cumberland, Md.  
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FOR MORE  
EFFICIENT  
PRODUCTION—

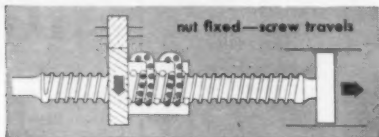
ACTUATE OR POSITION IT  
BETTER WITH

## SAGINAW <sup>b/b</sup> SCREWS

6 decisive advantages reduce  
manufacturing problems and costs:



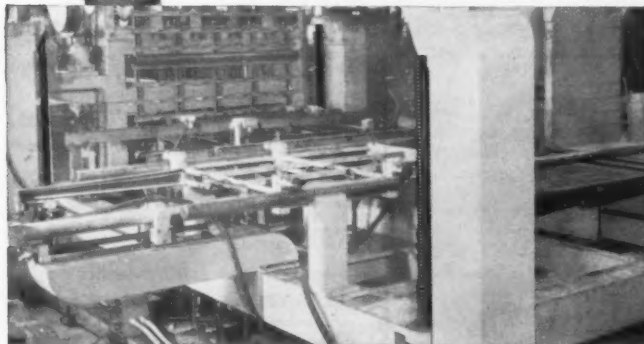
**FORWARD:** When rotary motion is applied to the screw, the b/b nut is driven along the axis of the screw, changing rotary motion to linear motion.



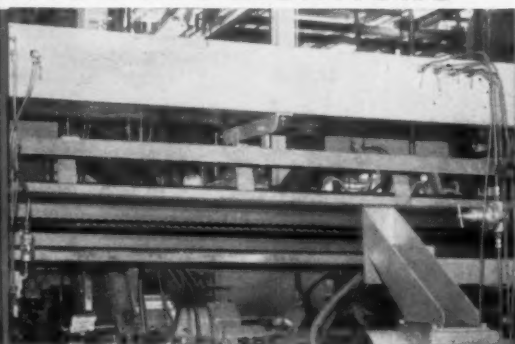
**FORWARD:** When rotary motion is applied to the b/b nut, the screw is driven along its longitudinal axis, changing rotary motion to linear motion.

- 1 POWER SAVINGS.** Operating with over 90% efficiency, Saginaw b/b Screws permit much smaller motors with far less drain on electrical systems, and also simplify circuitry.
- 2 SPACE SAVINGS.** Saginaw b/b Screws themselves are compact. They permit smaller motors and gear boxes and eliminate auxiliary equipment required by hydraulics.
- 3 DEPENDABLE PERFORMANCE.** Saginaw b/b Screws are far more reliable than hydraulics or pneumatics. Gothic arch grooves, yoke deflectors and multiple circuits provide added assurance.
- 4 PRECISE POSITIONING.** Saginaw b/b Screws will position components far more precisely than hydraulics or pneumatics; tolerances on position are held within .0006 in./ft. of travel.
- 5 TEMPERATURE TOLERANCE.** Normal operating temperature for Saginaw b/b Screws is from -75°F. to +275°F. But in selected materials, they will function efficiently at temperatures as high as +900°F.
- 6 LUBRICATION.** If lubrication fails the Saginaw b/b Screw will still function with remarkable efficiency. Units have been built and qualified for operation without lubrication.

### TYPICAL AUTOMATION APPLICATIONS



Automatic indexing device for stacking material. Saginaw b/b Screw used to raise and lower table.



Automatic device for loading and unloading machine. Saginaw b/b Screw used to save power and space.

If you would like further details on the use of Saginaw b/b Screws to increase the efficiency of plant operations, or specific application recommendations for your individual processes, experienced Saginaw engineers are at your service without obligation. Just write or phone us your requirements, or fill in and mail the handy coupon below.

# Saginaw

ball bearing Screw

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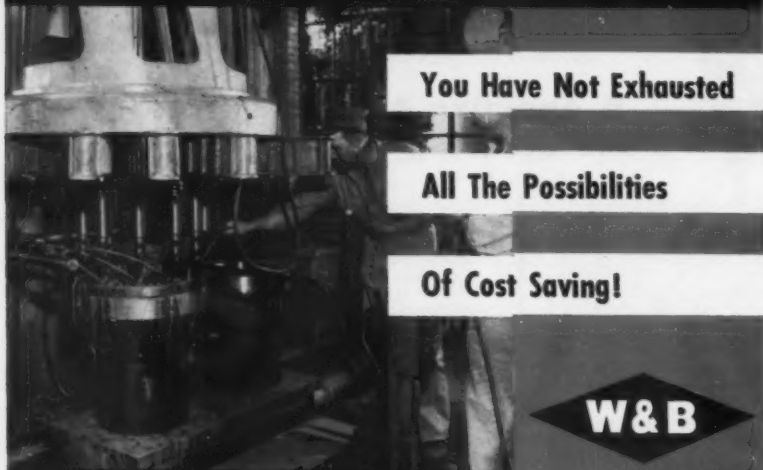
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WORLD'S LARGEST PRODUCER OF BALL BEARING SCREWS AND SPLINES

For more information fill in page number on Inquiry Card, on page 237

MACHINERY, October, 1957—293

# IF YOU HAVEN'T TESTED WHITMAN & BARNES DRILLS



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**Of Cost Saving!**

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**DRILLS  
and  
REAMERS**

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NEW YORK • CHICAGO • LOS ANGELES

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Ball & Roller Bearing Co., Danbury, Conn.  
Boston Gear Works, 3200 Main St., North  
Quincy, Mass.  
Fafnir Bearing Co., New Britain, Conn.  
Marlin-Rockwell Corp., 402 Chandler Bldg.,  
Jamestown, N. Y.  
New Departure Div., Bristol, Conn.  
Nide Ball Bearing Co., 30th & Hunting Park  
Ave., Philadelphia, Pa.  
Norma-Hoffman Bearings Corp., Stamford,  
Conn.

### BEARINGS, Bronze and Special Alloy

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Quincy, Mass.  
Bunting Brass & Bronze Co., 715 Spencer,  
Toledo, Ohio  
Centrifugally Cast Products Div., Shenango  
Furnace Co., Dover, Ohio  
Haynes Stellite Div., Union Carbide & Carbon  
Corp., 30 E. 42nd St., New York, N. Y.

### BEARINGS, Needle

Orange Roller Bearing Co., Inc., Orange, N. J.

### BEARINGS, Oilless

Bunting Brass & Bronze Co., 715 Spencer,  
Toledo 1, Ohio  
Ryersan, Jos. T. & Son, 2558 W. 16th St.,  
Chicago 18, Ill.

### BEARINGS, Roller

Ball & Roller Bearing Co., Danbury, Conn.  
Marlin-Rockwell Corp., 402 Chandler Bldg.,  
Jamestown, N. Y.  
Norma-Hoffman Bearings Corp., Stamford,  
Conn.  
Orange Roller Bearing Co., Inc., Orange, N. J.  
Rollway Bearings Co., Inc., 541 Seymour St.,  
Syracuse, N. Y.  
Timken Roller Bearing Co., Canton, Ohio

### BEARINGS, Thrust

Ball & Roller Bearing Co., Danbury, Conn.  
Bunting Brass & Bronze Co., 715 Spencer,  
Toledo, Ohio  
Centrifugally Cast Products Div., Shenango  
Furnace Co., Dover, Ohio  
Fafnir Bearing Co., New Britain, Conn.  
General Electric Co., Schenectady, N. Y.  
Marlin-Rockwell Corp., 402 Chandler Bldg.,  
Jamestown, N. Y.  
Nide Ball Bearing Co., Nicetown, Philadelphia,  
Pa.  
Norma-Hoffman Bearings Corp., Stamford,  
Conn.  
Orange Roller Bearing Co., Inc., Orange, N. J.  
Rollway Bearings Co., Inc., Syracuse, N. Y.  
Timken Roller Bearing Co., Canton, Ohio

**BELT SANDERS**—See Grinding Machines,  
Abrasive Belt

### BENCH CENTERS

Brown & Sharpe Mfg. Co., Providence, R. I.  
Delta Power Tool Div., 400 N. Lexington Ave.,  
Pittsburgh 8, Pa.  
Sundstrand Mch. Tool Co., 2531—11th St.,  
Rockford, Ill.

### BENCHES AND STOOLS

South Bend Lathe Works, South Bend 22, Ind.

### BENDERS, Bar, Tube, Channel, etc.

Bath, Cyril Co., 32324 Aurora Road, Solon,  
Ohio  
Greenlee Bros. & Co., 2136—12th St., Rock-  
ford, Ill.  
Wallace Supplies Mfg. Co., 1308 Diversey  
Parkway, Chicago 14, Ill.

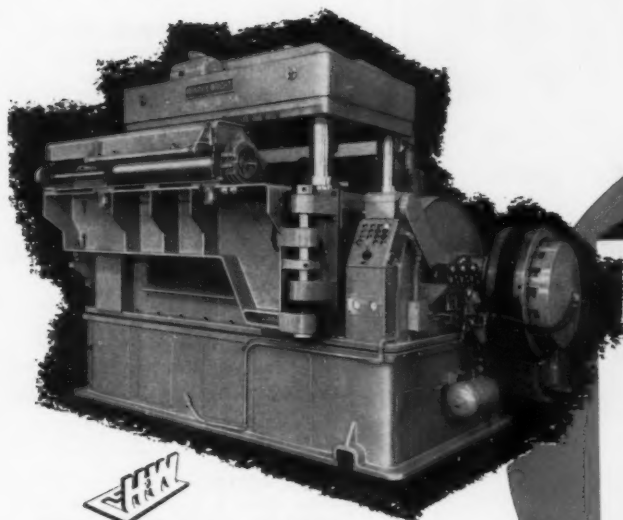
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Smith, R. E., Waukegan, Ill.

# HENRY & WRIGHT

a great name in  
metal stamping processes

## JOINS

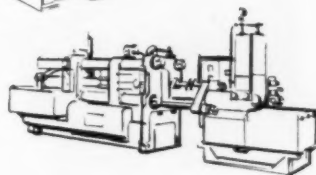
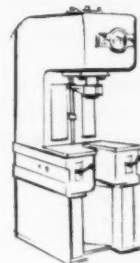
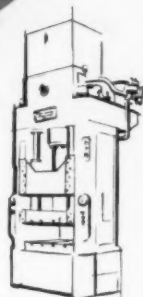
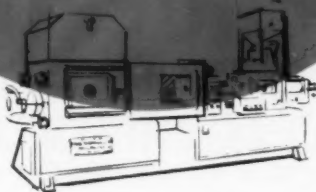


This is the new H & W Double Crank, 350 ton dieing machine which is designed to extend the economies of progressive metal stamping.

# HPM

Here's a combination of two great names in the metalworking industry—each with a tradition for service to specialized fields—each with a reputation for quality and the finest in machine design.

Henry & Wright Dieing Machines offer better, faster production to more uniform specifications than ever before. The new double crank H & W's provide greater flexibility in stamping. Greater precision and longer die life result from the improved design of these versatile machines. The H & W you buy today has the benefit of years of experience behind it; the combined personnel of H-P-M and H & W, with background covering both the mechanical and hydraulic fields, offers the finest "one-two" punch in the industry for your complete stamping and forming requirements.



Make H-P-M your headquarters for  
presswork production equipment. Now,  
more than ever before, there's an H-P-M  
designed for your job.

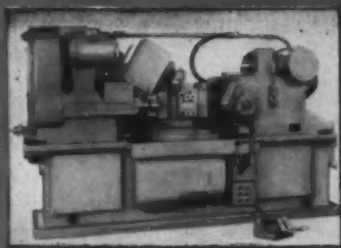
# HPM

**THE HYDRAULIC  
PRESS MFG. CO.**

Mount Gilead, Ohio, U.S.A.

A DIVISION OF KOEHRING COMPANY





What is done  
is DONE...  
on the GOSS & DE LEEUW



## AUTOMATIC CHUCKING MACHINE

There are no half-finished pieces lying around at the end of the day when you put your work on this outstanding machine.

The "1-2-3" feature—available only on the Goss & De Leeuw Automatic Chucker—provides the means of finish machining three ends of a part without changing set-up.



Note some of the typical parts machined. Ask for illustrated literature giving further details and send samples of your work for a cost estimate on handling it on the Goss & De Leeuw.



**GOSS & DE LEEUW**  
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

### BENDERS, Plate, Etc.

Bath, Cyril Co., 32324 Aurora Road, Salom, Ohio.  
Cincinnati Shaper Co., Happle & Gerrard, Cincinnati, Ohio.  
Dreis & Krump Mfg. Co., 7412 S. Loomis Blvd., Chicago 36, Ill.  
Niagara Mch. & Tool Wks., 637 Northland Ave., Buffalo 11, N. Y.  
Wallace Supplies Mfg. Co., 1308 Diversey Parkway, Chicago 14, Ill.

### BENDING MACHINES, Hydraulic

Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.  
Bethlehem Steel Co., Bethlehem, Pa.  
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.  
Chambersburg Engrg. Co., Chambersburg, Pa.  
Hannifin Corp., 501 Wolf Rd., Des Plaines, Ill.  
Hydraulic Press Mfg. Co., Mount Gilead, Ohio.  
Lake Erie Engrg. Corp., Kenmore Sta., Buffalo, N. Y.  
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.  
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.  
Wallace Supplies Mfg. Co., 1308 Diversey Parkway, Chicago 14, Ill.  
Watson-Stillman Co., Roselle, N. J.

### BENDING MACHINES, Pipe

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.  
Wallace Supplies Mfg. Co., 1308 Diversey Parkway, Chicago 14, Ill.  
Watson-Stillman Co., Roselle, N. J.

### BENDING ROLLS

Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., Cleveland, Ohio.  
Niagara Mch. & Tool Wks., 637 Northland Ave., Buffalo 11, N. Y.  
Wallace Supplies Mfg. Co., 1308 Diversey Parkway, Chicago 14, Ill.

### BLAST CLEANING EQUIPMENT

Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 38, Mich.  
Pangborn Corp., Hagerstown, Md.

### BLOWERS

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.

### BLUING LAYOUT

Dykem Co., 2307 N. 11th St., St. Louis 6, Mo.

### BOLTS, NUTS AND SCREWS

Allen Mfg. Co., 133 Sheldon St., Hartford 2, Conn.  
Bethlehem Steel Co., 701 East Third St., Bethlehem, Pa.  
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.  
Ottemiller, W. H., & Co., York, Pa.  
Parker-Kalon Div., Clifton, N. J.  
Russell Burdall & Ward Bolt & Nut Co., Port Chester, N. Y.  
Standard Pressed Steel Co., Jenkintown, Pa.  
Williams & Co., J. H., 400 Vulcan St., Buffalo 7, N. Y.

### BOOKS, Technical

Industrial Press, 93 Worth St., New York 13, N. Y.

### BORING BARS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.  
Bullard Co., 286 Canfield Ave., Bridgeport 6, Conn.  
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.  
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.  
Ingersoll Milling Machine Co., 2442 Douglas St., Rockford, Ill.  
Kennametal Inc., Latrobe, Penna.  
Lovejoy Tool Co., Inc., Springfield, Vt.  
Metallurgical Products Dept. of General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.

Scully-Jones & Co., 1906 Rockwell St., Chicago 8, Ill.  
 Universal Engineering Co., Frankenmuth 2, Mich.  
 Van Norman Mch. Co., 3640 Main St., Springfield 7, Mass.  
 Warner & Swasey, 5701 Carnegie Ave., Cleveland 3, Ohio.  
 Wesson Co., 1220 Woodward Heights Blvd., Detroit 20, Mich.  
 Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

#### BORING HEADS

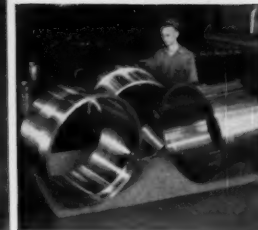
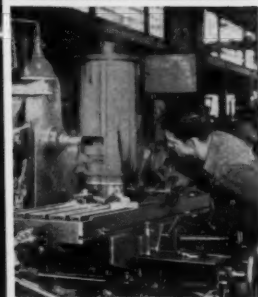
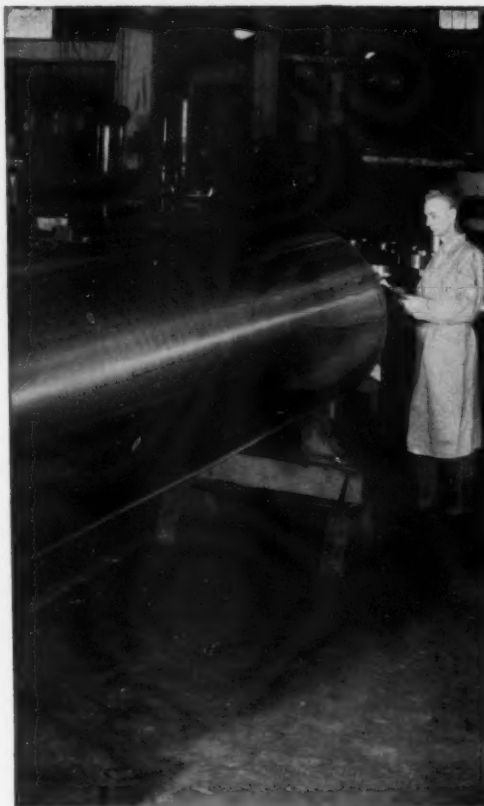
American Schiess Corp., 1232 Penn Ave., Pittsburgh 22, Pa.  
 Baker Brothers, Inc., 1000 Post St., Toledo 10, Ohio.  
 Bridgeport Machines, Inc., 500 Lindley St., Bridgeport 6, Conn.  
 Bryant Chucking Grinder Co., Clinton St., Springfield, Vt.  
 Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.  
 Heald Machine Co., 10 New Bond St., Worcester 6, Mass.  
 Homestrand, Inc., Larchmont, N. Y.  
 Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.  
 Lovejoy Tool Co., Inc., Springfield, Vt.  
 Mummet-Dixon Co., Hanover, Pa.  
 Standard Electrical Tool Co., 2500 River Rd., Cincinnati 4, Ohio.  
 Universal Engineering Co., Frankenmuth 2, Mich.  
 Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

#### BORING MACHINES

Aaron Machinery Co., Inc., 45 Crosby St., New York 12, N. Y.  
 Baker Brothers, Inc., 1000 Post St., Toledo 10, Ohio.  
 Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.  
 Bullard Co., Bridgeport 6, Conn.  
 Canton Tool Mfg. Co., E. Canton, Ohio.  
 Consolidated Mch. Tool Div., 565 Blossom Rd., Rochester 10, N. Y.  
 Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
 Cross Co., 3250 Bellevue, Detroit 7, Mich.  
 Davis & Thompson Co., 4460 N. 24th St., Milwaukee 10, Wis.  
 DeVlieg Machine Co., Ferndale, Mich.  
 Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
 G & L and Hypro Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.  
 Gray Co., G. A., 3611 Woodburn Ave., Cincinnati 7, Ohio.  
 Heald Machine Co., 10 New Bond St., Worcester 6, Mass.  
 Homestrand, Inc., Larchmont, N. Y.  
 Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.  
 Kaukauna Machine & Foundry Div., Giddings & Lewis Machine Tool Co., Kaukauna, Wis.  
 Kearney & Trecker Corp., Milwaukee, Wis.  
 La Salle Tool, Inc., 3840 E. Outer Drive, Detroit 34, Mich.  
 Moline Tool Co., Moline, Ill.  
 National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.  
 New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.  
 Olafsson Corp., Lansing, Mich.  
 Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.  
 Pope Machinery Co., Haverhill, Mass.  
 Sheffield Corp., Box 993, Dayton 1 Ohio.  
 Snyder Tool & Engrg. Co., 3400 E. Lafayette St., Detroit 9, Mich.  
 Wadell Equipment Co., Clark, N. J.  
 Wales-Strippit Co., Akron, N. Y.

#### BORING MILLS, Horizontal

American Schiess Corp., 1232 Penn Ave., Pittsburgh 22, Pa.  
 Bullard Co., Bridgeport 6, Conn.  
 Cincinnati Gilbert Machine Tool Co., 3366 Beekman St., Cincinnati 23, Ohio.  
 Consolidated Mch. Tool Div., 565 Blossom Rd., Rochester 10, N. Y.  
 Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
 Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.  
 G & L and Hypro Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.  
 Gray, G. A., Co., 3611 Woodburn Ave., Cincinnati 7, Ohio.  
 Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.  
 Innocenti, Milan, Italy.  
 Lucas Mch. Tool Div., New Britain Mch. Co., 12302 Kirby Ave., Cleveland 8, Ohio.  
 New Britain Mch. Co., New Britain, Conn.  
 Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.  
 Portage Machine Co., 1025 Sweitzer Ave., Akron 11, Ohio.  
 Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.



*You'll find them better for pressure if they're*

## SHENANGO CENTRIFUGAL CASTINGS

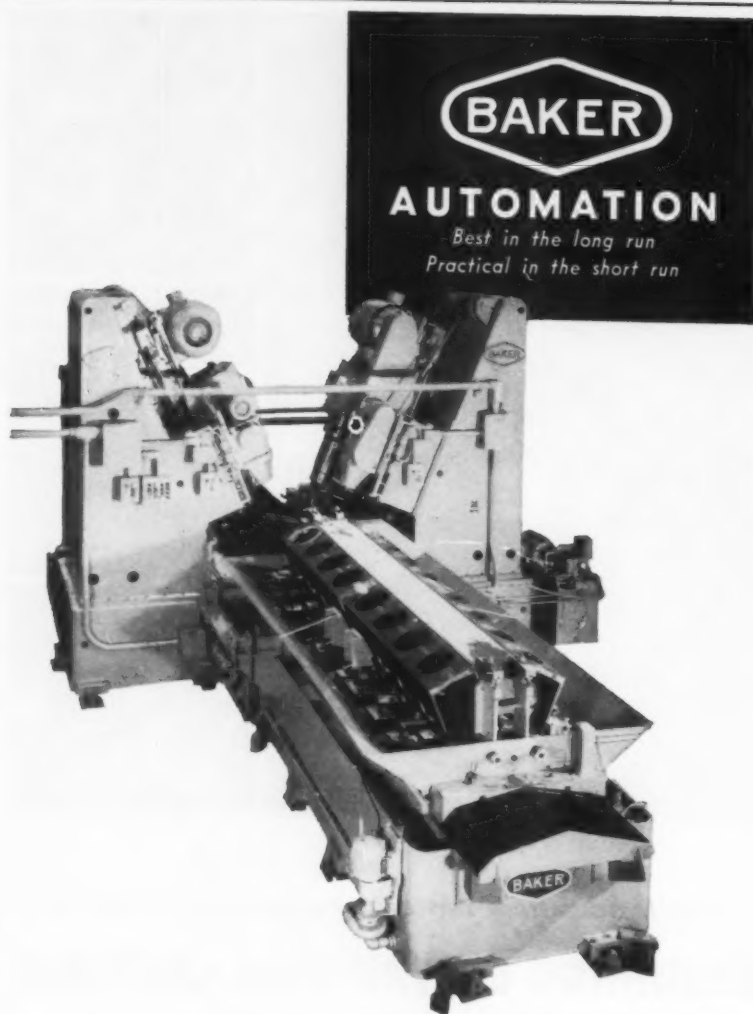
**W**HATEVER the inside or outside pressures, Shenango centrifugal castings are better able to withstand them without failure.

Parts cast by the Shenango centrifugal process are much tougher because their finer, *pressure-dense* grain avoids stress concentrations while providing greater strength, better elongation and freedom from such costly defects as sand inclusions, blowholes and such.

Whether you need rings, rolls, sleeves, liners, bushings, bearings, mandrels or *any* annular or symmetrical part . . . ferrous or non-ferrous . . . in whatever shape, size or dimension to meet your requirements . . . Shenango can do the job. And do the job *better!*

For informative bulletins on the answers to your tough problems, it will pay you to write now to: *Centrifugally Cast Products Division*, The Shenango Furnace Company, Dover, O.

**SHENANGO** CENTRIFUGAL CASTINGS  
 COPPER, TIN, LEAD, ZINC BRONZES • ALUMINUM AND MANGANESE BRONZES  
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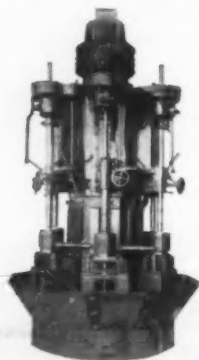


## NEW BAKER SPECIAL

bores diesel engine cylinder blocks - automatically

The latest of a long line of Baker special machine tools . . . operations are rough and finish bore and counterbore 6 to 16 holes for cylinder sleeves; drill dowel pin holes.

Compare with the early Baker special "Rotary" below — the *man* walked around the *machine*!



### BAKER BROTHERS, INC. Dept. M-1057, Toledo 10, Ohio

Send me data on automation with . . .

☐ Baker Specials ☐ Baker standard machines

NAME AND TITLE

COMPANY

ADDRESS

CITY

ZONE STATE

### BORING MILLS, Vertical

American Schiess Corp., 1232 Penn Ave., Pittsburgh 22, Pa.  
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.  
Bullard Co., 286 Canfield Ave., Bridgeport 6, Conn.  
Consolidated Mch. Tool Div., 565 Blossom Rd., Rochester 10, N. Y.  
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
G & L and Hypra Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.  
Kaukauna Machine & Foundry Div., Giddings & Lewis Machine Tool Co., Kaukauna, Wis.  
King Machine Tool Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio.  
New Britain Mch. Co., New Britain, Conn.  
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.  
Portage Mch. Co., 1025 Sweitzer Ave., Akron 11, Ohio.  
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.

### BORING TOOLS

American Schiess Corp., 1232 Penn Ave., Pittsburgh 22, Pa.  
Apex Tool & Cutter Co., Inc., 285 Canal St., Shelton, Conn.  
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago 11, Ill.  
Bullard Co., 286 Canfield Ave., Bridgeport 6, Conn.  
Crucible Steel Co. of America, Henry W. Oliver Bldg., Mellon Sq., Pittsburgh 2, Pa.  
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.  
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
Kennametal Inc., Latrobe, Penna.  
Metallurgical Products Dept. of General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.  
Portage Machine Co., 1025 Sweitzer Ave., Akron 11, Ohio.  
Pratt & Whitney Co., Inc., West Hartford, Conn.  
Scully-Jones & Co., 1906 Rockwell St., Chicago 8, Ill.  
Vascoloy-Ramet Corp., Waukegan, Ill.  
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.  
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

### BRAKES, Press and Bending

Bath, Cyril Co., 32324 Aurora Road, Solon, Ohio.  
Cincinnati Shaper Co., Hopple & Gerrard, Cincinnati, Ohio.  
Cleveland Crane & Engrg. Co., Wickliffe, Ohio.  
Dreis & Krump Mfg. Co., 7412 S. Loomis Blvd., Chicago 36, Ill.  
Ferracute Machine Co., Bridgeport, N. J.  
Lodge & Shipley Co., Hamilton 1, Ohio.  
Niagara Mch. & Tool Wks., 637 Northland Ave., Buffalo 11, N. Y.  
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.  
Watson-Stillman Co., Roselle, N. J.

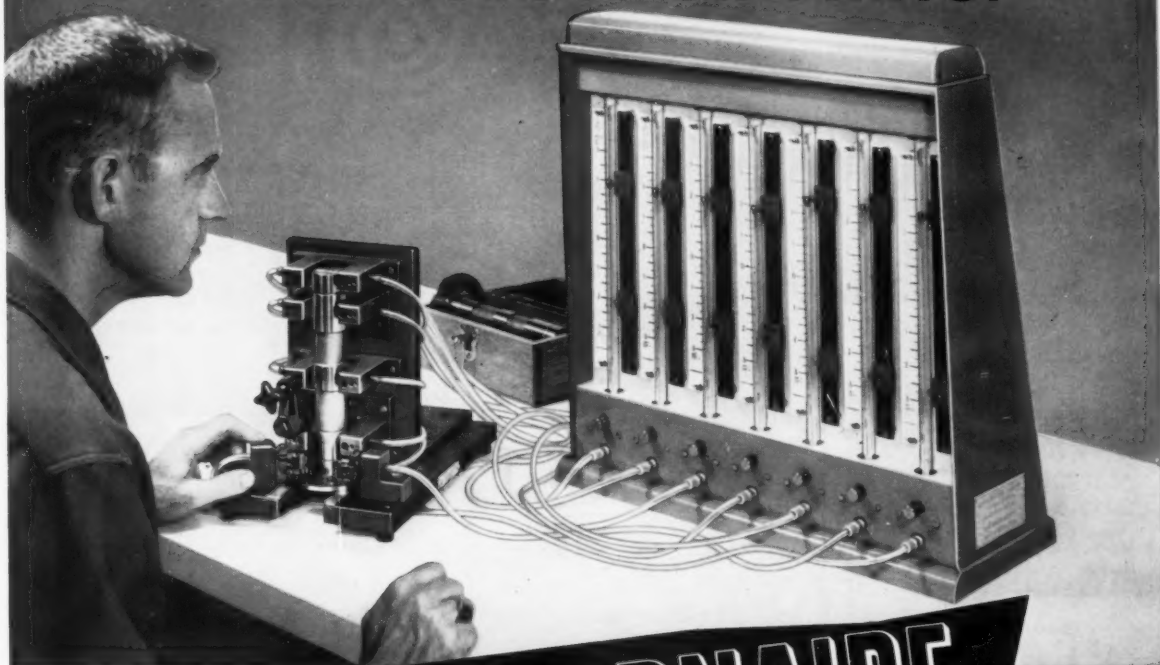
### BRASS

American Brass Co., 25 Broadway, New York, N. Y.  
Bridgeport Brass Co., Bridgeport, Conn.  
Mueller Brass Co., Port Huron 35, Mich.  
Revere Copper & Brass, Inc., 230 Park Ave., New York, N. Y.

### BROACHES

American Broach & Mch. Co., Ann Arbor, Mich.  
Colonial Broach & Machine Co., P.O. Box 37, Harper Sta., Detroit 13, Mich.  
Detroit Broach Co., Inc., 950 S. Rochester Rd., Rochester, Mich.  
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
Lapointe Mch. Tl. Co., Tower St., Hudson, Mass.  
Metallurgical Products Dept. of General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.  
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.  
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.  
Sundstrand Mch. Tool Co., 2531—11th St., Rockford, Ill.  
Threadwell Tap & Die-Co., 16 Arch St., Greenfield, Mass.  
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

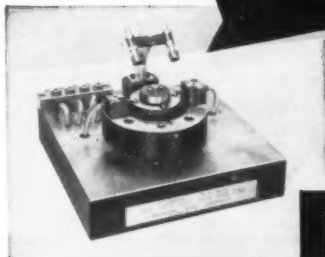
# Speed Inspection OF PRODUCTION PARTS!



**NEW**

## DEARBORNAIRE

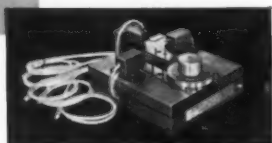
### MULTIPLE COLUMN AIR GAGING INSTRUMENTS



**Special Air Gaging Fixtures**  
designed and built to meet your particular application requirements. Complete engineering service available upon request.



Send part print showing all dimensions to be checked and tolerances required for prompt quotation and delivery.



To speed inspection of production parts, new Dearbornaire air gaging instruments are now offered in multiple column units designed to permit more accurate simultaneous checking of as many dimensions as may be required for a given part. What's more, each unit incorporates all of the advanced design features which have made Dearbornaire the most practical, most versatile column type instrument ever produced...

- New higher rated pressure system and built-in circuit restrictions make them virtually self-cleaning, reduce maintenance to a minimum.
  - New glass tube has a characterized internal taper which provides positive linear accuracy over the full extent of the calibrated scales.
  - Easy-to-read Zero-centered scales permit use of instrument for normal inspection, statistical quality control, and as a tool setting gage.
  - Interchangeability of component parts simplifies conversion from one amplification to another, reduces spare parts inventory costs.
- Plus a complete line of air gage spindles, rings, snaps and cartridges all precision finished to give you greater accuracy, longer wear life. Free demonstration arranged upon request. Write for details today!

**AIR GAGE DIVISION  
DEARBORN GAGE COMPANY**  
22038 Beech Street • Dearborn, Michigan





## WATCH THE HUMPS IF YOU SCORCH



Back in 1907, speed limit laws were often arbitrarily severe, even if enforcement was apt to be haphazard. The usual limits were 8 miles in town, 15 miles in the country. Those who liked to speed were called "scorchers." To put a damper on the activities of these gay blades, some towns installed sharp ridges or "humps" several inches high across their streets, at regular intervals. If a motorist was foolish enough to run over one of these "humps" at 20 or 30 miles an hour, he was likely to suffer a couple of blown tires or broken springs, as well as considerable discomfort.

Fifty years ago when our founders started in making gears people firmly believed "haste makes waste." Today our standards of "haste" (and "scorching") have changed, at least in degree, but there is still truth in this saying. It particularly applies in making important decisions—such as where to buy your custom gears. A lot of people who have given the matter careful attention come to us for the best custom gears obtainable—because they've found out that it pays in the long run. Try us on your next custom gear order, and we think you'll agree with them.

### THE CINCINNATI GEAR CO. CINCINNATI 27, OHIO

Fifty Years of "Gears—Good Gears Only"



300—MACHINERY, October, 1957

### BROACHING MACHINE, Internal

American Broach & Mch. Co., Ann Arbor, Mich.  
Colonial Broach & Machine Co., P.O. Box 37, Harper Sta., Detroit 13, Mich.  
Detroit Broach Co., Rochester, Mich.  
Lapointe Mch. Tl. Co., Tower St., Hudson, Mass.  
Sundstrand Mch. Tool Co., 2531—11th St., Rockford, Ill.  
Wilson, K. R., Inc., 211 Mill St., Arcade, N. Y.

### BROACHING MACHINE, Surface

American Broach & Mch. Co., Ann Arbor, Mich.  
Cincinnati Milling and Grinding Mchs., Inc., Cincinnati, Ohio.  
Colonial Broach & Machine Co., P.O. Box 37, Harper Sta., Detroit 13, Mich.  
Detroit Broach Co., Rochester, Mich.  
Foote-Burt Co., 13000 St. Clair Ave., Cleveland 8, Ohio.  
Lapointe Mch. Tl. Co., Tower St., Hudson, Mass.  
Sundstrand Mch. Tool Co., 2531—11th St., Rockford, Ill.

### BRONZE

American Brass Co., Waterbury 20, Conn.  
Bridgeport Brass Co., Bridgeport, Conn.  
Mueller Brass Co., Port Huron 35, Mich.

### BRUSHES, Industrial, Tampico, Wire Wheel, Etc.

Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.  
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, Ohio.

### BUFFERS

Delta Power Tool Div., 400 Lexington Ave., Pittsburgh 8, Pa.  
Pittsburgh Plate Glass Co., Brush Div., Baltimore 29, Md.  
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.

### BULLDOZERS, Metalforming

Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.  
Elmes Eng. Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio.  
Farquhar Div., A. B., 142 N. Duke St., York, Pa.  
Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.  
Watson-Stillman Co., Roselle, N. J.

### BURNISHING MACHINES

Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.  
Russell, Holbrook & Henderson, Inc., 292 Madison Ave., New York 17, N. Y.

### BURRING MACHINES—See Deburring Machines

### BURRS—See Files and Burrs, Rotary

### BUSHINGS, Drill Jig

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
Metrol Carbides Corp., 6001 Southern Blvd., Youngstown 12, Ohio.  
Universal Engrg. Co., Frankenmuth, Mich.

### BUSHINGS, Hardened Steel

Universal Engrg. Co., Frankenmuth, Mich.

### BUSHINGS, Non-ferrous and Powdered Metal

American Crucible Products Co., Lorain, Ohio.  
Bunting Brass & Bronze Co., 715 Spencer, Toledo, Ohio.  
Universal Engrg. Co., Frankenmuth, Mich.

### CABINETS, Tool

Standard Pressed Steel Co., Jenkintown, Pa.

### CALIPERS, Spring, Firm-Joint, Transfer, Hermaphrodite, etc.—See Layout and Drafting Tools, Machinists' Small Tools

### CALIPERS, Vernier

Brown & Sharpe Mfg. Co., Providence, R. I.  
DoAll Co., Des Plaines, Ill.  
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.  
Starrett, The L. S. Co., Athol, Mass.

### CAM CUTTING MACHINES

Cincinnati Milling and Grinding Mchs., Inc., Cincinnati 9, Ohio.  
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.  
Pratt & Whitney Co., Inc., West Hartford, Conn.  
Russell Holbrook & Henderson, Inc., 292 Madison Ave., New York 17, N. Y.  
Sundstrand Mch. Tool Co., 2531—11th St., Rockford, Ill.  
Van Norman Mch. Co., 3640 Main St., Springfield 7, Mass.

### CAM MILLING AND GRINDING MACHINES

American Schiesl Corp., 1232 Penn Ave., Pittsburgh 22, Pa.  
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.  
Cincinnati Milling Machine Co., Oakley, Cincinnati, Ohio.  
Landis Tool Co., Waynesboro, Pa.  
Rowbottom Machine Co., Waterbury, Conn.

### CAMS

Brown & Sharpe Mfg. Co., Providence, R. I.  
Eisler Engrg. Co., Inc., 750 S. 13th, Newark 3, N. J.  
Hartford Special Machinery Co., 287 Homestead St., Hartford, Conn.  
Rowbottom Machine Co., Waterbury, Conn.

### CARBIDES

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.  
Chicago-Latrabe, 411 W. Ontario St., Chicago 10, Ill.  
DoAll Co., Des Plaines, Ill.  
Kennametal, Inc., Latrobe, Pa.  
Linde Co., 30 E. 42nd St., New York 17, N. Y.  
Metal Carbides Corp., Youngstown, Ohio.  
Metallurgical Products Dept. of General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.  
Vascoloy-Ramet Corp., Waukegan, Ill.  
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

### CASTINGS, Die

American Brass Co., Waterbury 20, Conn.  
Madison-Kipp Corp., Madison, Wis.

### CASTINGS, Non-ferrous

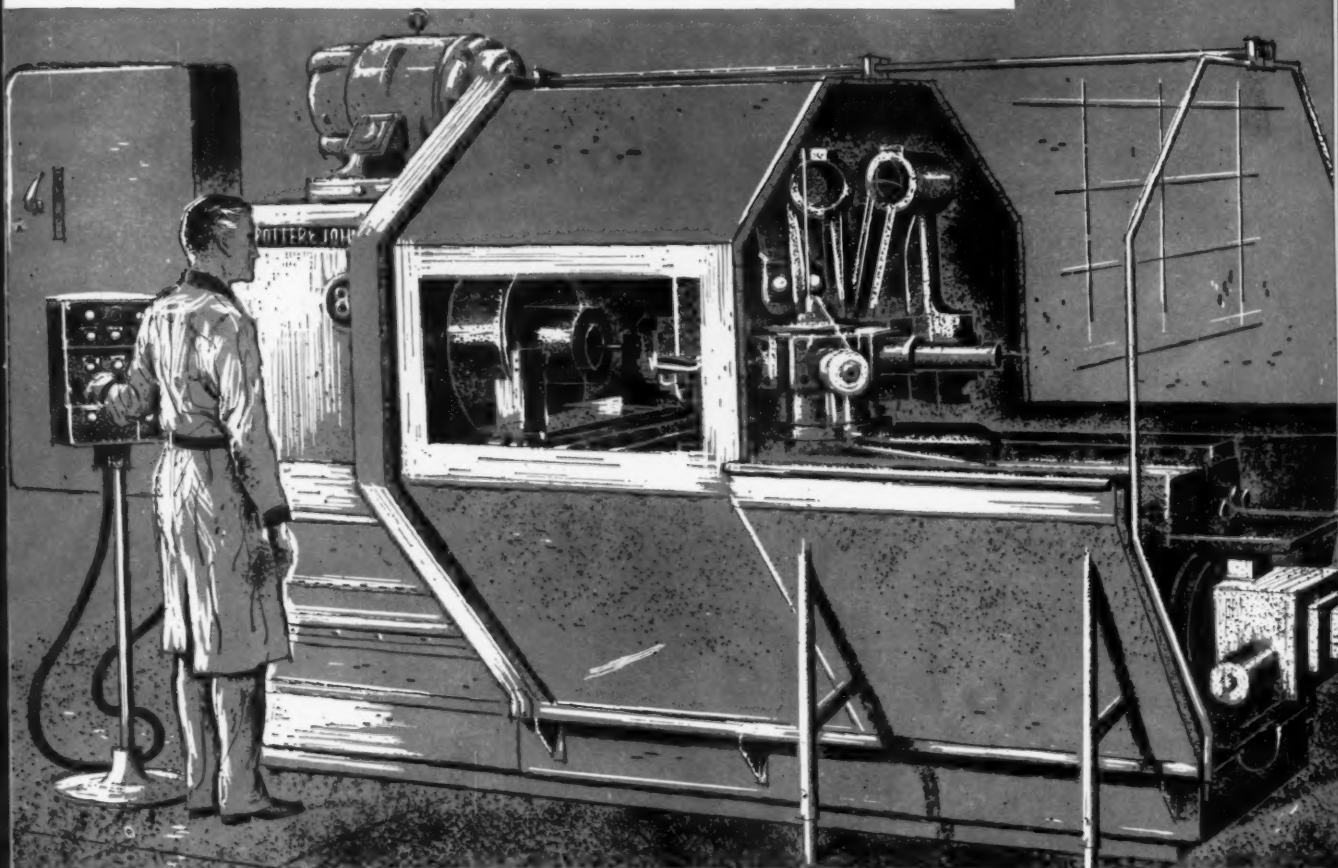
American Crucible Products Co., Lorain, Ohio.  
Bethlehem Steel Co., 701 East Third St., Bethlehem, Pa.  
Centrifugally Cast Products Div., Shenango Furnace Co., Dover, Ohio.  
Dow Chemical Co., Midland, Mich.  
Mueller Brass Co., Port Huron 35, Mich.  
Vascoloy-Ramet Corp., Waukegan, Ill.

### CASTINGS—Gray Iron, Malleable

Bethlehem Steel Co., 701 East Third St., Bethlehem, Pa.  
Centrifugally Cast Products Div.—Shenango Furnace Co., Dover, Ohio.  
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.  
Kaukauna Machine & Foundry Div., Giddings & Lewis Machine Tool Co., Kaukauna, Wis.  
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

For more information fill in page number on Inquiry Card, on page 237

*Here it is . . . the machine  
industry's been asking for !\**



## THE **NEW P & J 8-U** AUTOMATIC Turret Lathe

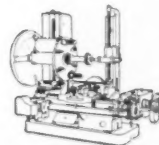
**\*A MACHINE TO FILL THE GAP BETWEEN OUR 6 DREL-40 AND 10-U**

Here is a new automatic with the extra power, rigidity and capacity you may be looking for. It's designed and engineered to handle your really big, hard-to-machine jobs faster, better and more economically than ever before. It will hog out tough alloys in a hurry, hold close tolerances and produce fine finishes with speed and efficiency. The 8-U with 50 hp, 30" chuck and 40" swing is intermediate in size between our 6 DREL-40 and 10-U. Take a minute now to write for specification circular and see how the new P&J 8-U fits into your production schedules.

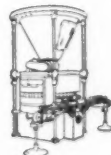
Potter & Johnston Company, Pawtucket, Rhode Island.



AUTOMATIC TURRET LATHES



GEAR CUTTERS



GILDA PACKAGING MACHINES



**POTTER & JOHNSTON**

SUBSIDIARY OF PRATT & WHITNEY COMPANY, INC.

PRECISION PRODUCTION TOOLING SINCE 1898

**CASTINGS, Steel, Stainless, etc.**

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.  
Bethlehem Steel Co., 701 East Third St.,  
Bethlehem, Pa.  
Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.  
Crucible Steel Co. of America, Henry W.  
Oliver Bldg., Pittsburgh 22, Pa.

**CEMENT, Abrasive Disc**

Delta Power Tool Div., 400 N. Lexington Ave.,  
Pittsburgh 8, Pa.  
Walls Sales Corp., 333 Nassau Ave., Brooklyn  
22, N. Y.

**CENTER-DRILLING MACHINES**

Baker Brothers, Inc., 1000 Post St., Toledo 10,  
Ohio.  
Hartford Special Machinery Co., 287 Home-  
stead St., Hartford, Conn.  
La Salle Tool, Inc., 3840 E. Outer Drive, De-  
troit 34, Mich.  
Seneca Falls Mch. Co., Seneca Falls, N. Y.  
Sundstrand Mch. Tool Co., 2531 11th St.,  
Rockford, Ill.

**CENTER PUNCHES** — See Machinists' Small Tools**CENTERS, Grinding Machines, Indexing Head and Lathe**

Houston Grinding & Mfg. Co., Inc., Houston 8,  
Texas.  
Metal Carbides Corp., Youngstown, Ohio.  
Metallurgical Products Dept. of General Elec-  
tric Co., Box 237, Roosevelt Park Annex,  
Detroit, Mich.  
Scully Jones & Co., 1906 Rockwell St., Chicago  
8, Ill.  
Wesson Co., 1220 Woodward Heights Blvd.,  
Ferndale, Mich.  
Whitman & Barnes, 40600 Plymouth Rd.,  
Plymouth, Mich.

**CERAMIC TOOL MATERIAL**—See Tool Material, Ceramic**CHAINS, Power Transmission and Conveyor**

Boston Gear Works, 14 Hayward St., Quincy  
71, Mass.

**CHUCKING MACHINES, Multiple-Spindle Automatic**

Baird Machine Co., 1700 Stratford Ave., Strat-  
ford, Conn.  
Bullard Co., 286 Canfield Ave., Bridgeport 6,  
Conn.  
Cone Automatic Mch. Co., Inc., Windsor, Vt.  
Cross Co., 3250 Bellevue Ave., Detroit 7,  
Mich.  
Goss & DeLeeuw Mch. Co., Kensington, Conn.  
National Acme Co., 170 E. 131st St., Cleve-  
land, Ohio.  
New Britain Mch. Co., New Britain-Gridley  
Mch. Div., New Britain, Conn.  
Olofsson Corp., 2729 Lyons Ave., Lansing,  
Mich.  
Pratt & Whitney Co., Inc., West Hartford,  
Conn.  
Warner & Swasey, 5701 Carnegie Ave., Cleve-  
land 3, Ohio.

**CHUCKING MACHINES, Single-Spindle Automatic**

Bullard Co., 286 Canfield Ave., Bridgeport 6,  
Conn.  
Cleveland Automatic Machine Co., 4932 Beech  
St., Cincinnati 12, Ohio.  
Gisholt Machine Co., 1245 E. Washington  
Ave., Madison 10, Wis.  
Jones & Lamson Mch. Co., Springfield, Vt.  
National Acme Co., 170 E. 131st St., Cleve-  
land, Ohio.  
Potter and Johnston Co., 1027 Newport Ave.,  
Pawtucket, R. I.  
Russell Holbrook & Henderson, Inc., 292 Mad-  
ison Ave., New York 17, N. Y.

Seneca Falls Mch. Co., Seneca Falls, N. Y.  
Sundstrand Mch. Tool Co., 2531 11th St.,  
Rockford, Ill.  
Warner & Swasey Co., 5701 Carnegie Ave.,  
Cleveland 83, Ohio.

**CHUCKS, Air Operated**

Axelson Mfg. Co., 6160 S. Boyle Ave., Los  
Angeles 58, Calif.  
Cushman Chuck Co., Windsor Ave., Hartford  
2, Conn.  
Gisholt Machine Co., 1245 E. Washington Ave.,  
Madison 10, Wis.  
Logansport Machine Co., Inc., 810 Center Ave.,  
Logansport, Ind.  
Schrader's Son, A., 470 Vanderbilt Avenue,  
Brooklyn, N. Y.  
Skinner Chuck Co., 95 Edgewood Ave., New  
Britain, Conn.

**CHUCKS, Collet**

Bryant Chucking Grinder Co., Clinton St.,  
Springfield, Vt.  
Cleveland Automatic Machine Co., 4932 Beech  
St., Cincinnati 12, Ohio.  
Cushman Chuck Co., 800 Windsor St., Hart-  
ford 2, Conn.  
Delta Power Tool Div., 400 N. Lexington Ave.,  
Pittsburgh 8, Pa.  
Errington Mech. Lab. Inc., 24 Norwood Ave.,  
Staten Island 4, N. Y.  
Gisholt Mch. Co., 1245 E. Washington Ave.,  
Madison 10, Wis.  
Gorton Mch. Co., Geo., 1321 Racine St.,  
Racine, Wis.  
Hardinge Bros., Inc., 1420 College Ave.,  
Elmira, N. Y.  
Jacobs Mfg. Co., West Hartford 10, Conn.  
Kearney & Trecker Corp., Milwaukee 14, Wis.  
National Acme Co., 170 E. 131st St., Cleve-  
land 8, Ohio.  
New Britain Mch. Co., New Britain-Gridley  
Mch. Div., New Britain, Conn.  
South Bend Lathe Works, Inc., 425 E. Madison  
St., South Bend, Ind.  
Universal Engrg. Co., Frankenthuth 2, Mich.  
Warner & Swasey, 5701 Carnegie Ave., Cleve-  
land 3, Ohio.

**CHUCKS, Combination Universal-Independent**

Cushman Chuck Co., 806 Windsor St., Hart-  
ford 2, Conn.  
Gisholt Mch. Co., Madison 10, Wis.  
Horton Chuck, Windsor Locks, Conn.  
Kearney & Trecker Corp., Milwaukee 14, Wis.  
National Acme Co., 170 E. 131st St., Cleve-  
land 8, Ohio.  
Skinner Chuck Co., 95 Edgewood Ave., New  
Britain, Conn.

**CHUCKS, Compensating**

Cushman Chuck Co., 806 Windsor St., Hart-  
ford 2, Conn.  
Logansport Mch. Co., Inc., Logansport, Ind.  
Skinner Chuck Co., 95 Edgewood Ave., New  
Britain, Conn.

**CHUCKS, Diaphragm**

Bryant Chucking Grinder Co., Clinton St.,  
Springfield, Vt.  
Wadell Equip. Co., Terminal Ave., Clark, N. J.

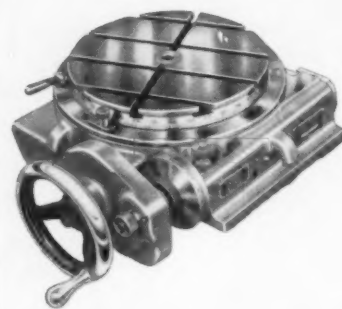
**CHUCKS, Drill, Key Type**

Delta Power Tool Div., 400 Lexington Ave.,  
Pittsburgh 8, Pa.  
Jacobs Mfg. Co., West Hartford, Conn.

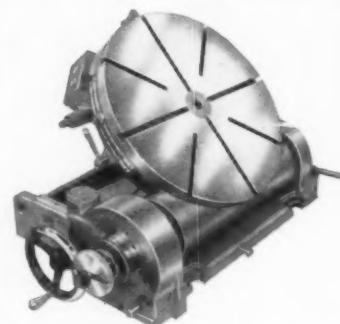
**CHUCKS, Drill, Keyless**

Delta Power Tool Div., 400 Lexington Ave.,  
Pittsburgh 8, Pa.  
Jacobs Mfg. Co., West Hartford, Conn.  
Scully-Jones & Co., 1906 Rockwell St., Chicago  
8, Ill.

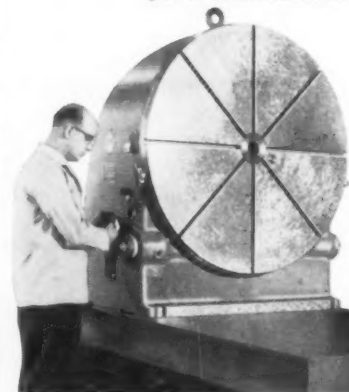
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**PLAIN . . . in 12" to 50"**  
12" and 20" diameter hand-operated  
and 24", 30", 42" and 50"  
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Also available in 42" tables  
with automatic indexing or with  
P&W Numerical Control.



**TILTING . . . in 10" to 36"**  
10" and 16" diameter hand-operated  
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power-rotated models.



**VERTICAL . . . in 30" and 48"**  
diameters, motor-driven.



**PRATT & WHITNEY**



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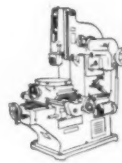
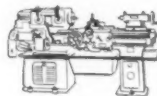
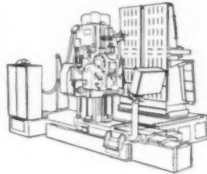
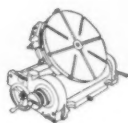
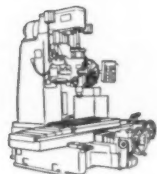
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The high-precision special machines manufactured by the Bodine Corporation of Bridgeport, Connecticut are used throughout the mass-producing industries to process small parts. The heart of every Bodine machine is the "dial" which requires from 20 to 200 accurately bored holes arranged in from 10 to 36 stations. To improve the precision of this critical component, the Bodine Corporation recently purchased a new Pratt & Whitney 24" Optical Rotary Table. As a result, tolerance between stations on the dial has been cut from 15 seconds of arc down to just 3 seconds and, as a spokesman for Bodine Corporation has stated, "... the improved efficiency of our product is obvious!" In addition to this table's greater

accuracy, Bodine also likes the easy-to-read optical screen that cuts down on operator fatigue and the fact that constant use produces absolutely no error from wear.

If any of your own machining, inspecting or calibrating operations require extremely accurate circular spacing or angular positioning, it is more than likely that a Pratt & Whitney Optical Rotary Table can help you improve your product's precision and performance.

Write now for complete information.  
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12 Charter Oak Boulevard, West Hartford, Conn.



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FIRST CHOICE FOR ACCURACY

MACHINE TOOLS • GAGES • CUTTING TOOLS



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Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, Staten Island, N. Y.  
Gisholt Mch. Co., Madison 10, Wis.  
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.  
Universal Engineering Co., Frankenmuth 2, Mich.

**CHUCKS, Gear**

Bryant Chucking Grinder Co., Clinton St., Springfield, Vt.  
Cushman Chuck Co., 806 Windsor St., Hartford 2, Conn.  
Horton Chuck, Windsor Locks, Conn.  
Le Maire Tool & Mfg. Co., Dearborn, Mich.

**CHUCKS, Independent**

Cushman Chuck Co., 806 Windsor St., Hartford 2, Conn.  
Gisholt Mch. Co., Madison 10, Wis.  
Homestrand, Inc., Larchmont, N. Y.  
Horton Chuck, Windsor Locks, Conn.  
Skinner Chuck Co., 95 Edgewood Ave., New Britain, Conn.

**CHUCKS, Lathes, etc.**

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Calif.  
Bullard Co., Brewster St., Bridgeport 2, Conn.  
Cushman Chuck Co., Windsor Ave., Hartford 2, Conn.  
Gisholt Mch. Co., Madison 10, Wis.  
Horton Chuck, Windsor Locks, Conn.  
Jacobs Mfg. Co., West Hartford, Conn.  
Jones & Lamson Mch. Co., Springfield, Vt.  
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.  
Skinner Chuck Co., 95 Edgewood Ave., New Britain, Conn.  
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.  
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.  
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

**CHUCKS, Magnetic**

Brown & Sharpe Mfg. Co., Providence, R. I.  
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.  
Hanchett Magna-Lock Corp., Big Rapids, Mich.  
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.  
Walker, O. S., Inc., Worcester, Mass.

**CHUCKS, Power Operated**

Cushman Chuck Co., 806 Windsor St., Hartford 2, Conn.  
Gisholt Mch. Co., Madison 10, Wis.  
Logansport Mch. Co., Inc., Logansport, Ind.  
Skinner Chuck Co., 95 Edgewood Ave., New Britain, Conn.

**CHUCKS, Quick Change and Safety**

Jacobs Mfg. Co., West Hartford 10, Conn.  
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.  
Scully-Jones & Co., 1906 Rockwell St., Chicago 8, Ill.  
Universal Engineering Co., Frankenmuth 2, Mich.

**CHUCKS, Ring Wheel**

Cushman Chuck Co., 806 Windsor St., Hartford 2, Conn.  
Gardner Mch. Co., 414 E. Gardner St., Beloit, Wis.

**CHUCKS, Tapping**

DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.  
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, Staten Island, N. Y.  
Jacobs Mfg. Co., West Hartford, Conn.

Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.  
Skinner Chuck Co., 95 Edgewood Ave., New Britain, Conn.

**CHUCKS, Universal Three-Jaw**

Cushman Chuck Co., 806 Windsor St., Hartford 2, Conn.  
Delta Power Tool Div., 400 Lexington Ave., Pittsburgh 8, Pa.  
Gisholt Mch. Co., Madison 10, Wis.  
Homestrand, Inc., Larchmont, N. Y.  
Horton Chuck, Windsor Locks, Conn.  
Kearney & Trecker Corp., Milwaukee 14, Wis.  
Logansport Mch. Co., Inc., Logansport, Ind.  
Skinner Chuck Co., 95 Edgewood Ave., New Britain, Conn.  
Warner & Swasey, 5701 Carnegie Ave., Cleveland 3, Ohio.

**CHUCKS, Wrenchless**

Gisholt Mch. Co., Madison 10, Wis.

**CIRCUIT-BREAKERS**

General Electric Co., Schenectady 5, N. Y.

**CLAMPS, "C", Toggle, Toolmakers' Parallel—See Set-Up Equipment Spacing Equipment****CLEANERS, Metal**

Oakite Products, Inc., 19 Rector St., New York, N. Y.

**CLUTCHES**

Cleveland Punch & Shear Works, Co., 3917 St. Clair Ave., Cleveland 14, Ohio.  
Dynamatic Div. Eaton Mfg. Co., Kenosha, Wis.  
Fawick Corp., Cleveland, Ohio.  
Minster Mch. Co., Minster, Ohio.  
Rockford Clutch Div., Rockford, Ill.

**COLLETS—See Chucks, Collet****COMBINATION SQUARES—See Machinists' Small Tools****COMPARATORS, Dial, Electronic and Air**

DoAll Co., Des Plaines, Ill.  
Federal Products Corp., 1144 Eddy St., Providence 1, R. I.  
Hanson-Whitney Co., 169 Bartholomew Ave., Hartford 3, Conn. (dial, thread)  
Sheffield Corp., Box 893, Dayton 1, Ohio.  
Starrett, L. S., Co., Athol, Mass.

**COMPARATORS, Optical**

Bausch & Lomb Optical Co., Rochester, N. Y.  
DoAll Co., 54 Laurel Ave., Des Plaines, Ill.  
Eastman Kodak Co., Rochester, N. Y.  
Jones & Lamson Mch. Co., Springfield, Vt.  
Opto-Metric Tools, Inc., 137 Varick St., New York, N. Y.  
Scherr, George, Co., Inc., 200 Lafayette St., New York 1, N. Y.

**COMPOUNDS, Cleaning—See Cleaners, Metal****COMPOUNDS, Cutting, Grinding, Metal Drawing, etc.—See Cutting and Grinding Fluids****COMPRESSORS, Air**

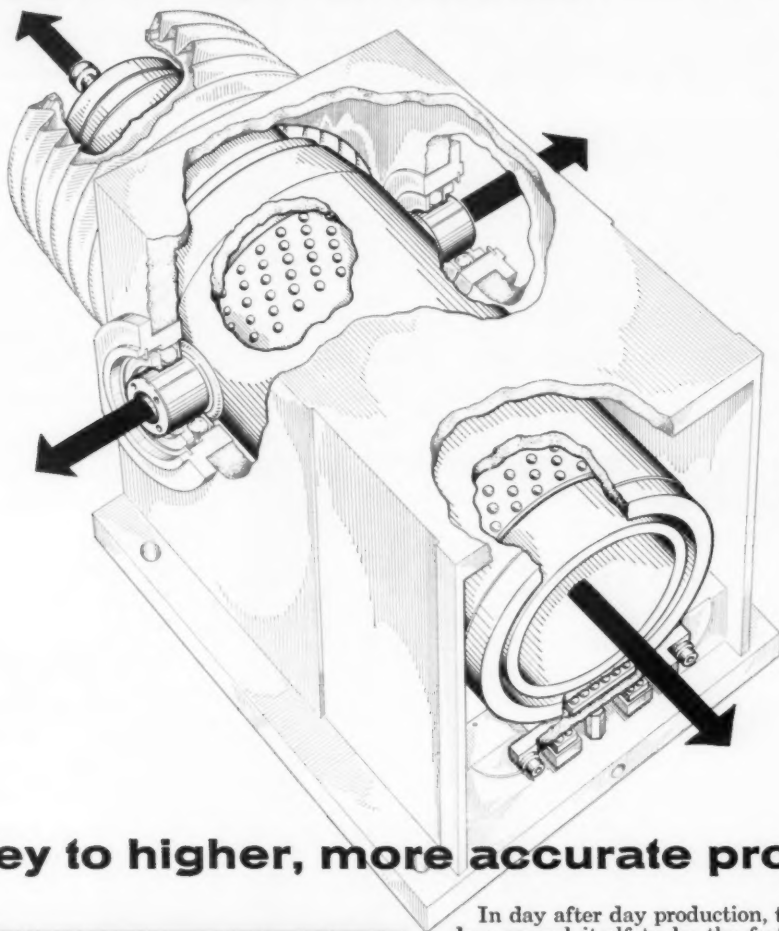
Chicago Pneumatic Tool Co., New York 17, N. Y.  
Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.  
Wilson, K. R., Inc., Arcade, N. Y.

**The BRYANT****Meet T. D. DETHEROW**

... one of Bryant's experts on internal grinding of all types. Tom, who has been with Bryant for 17 years, is in charge of the Chicago territory.

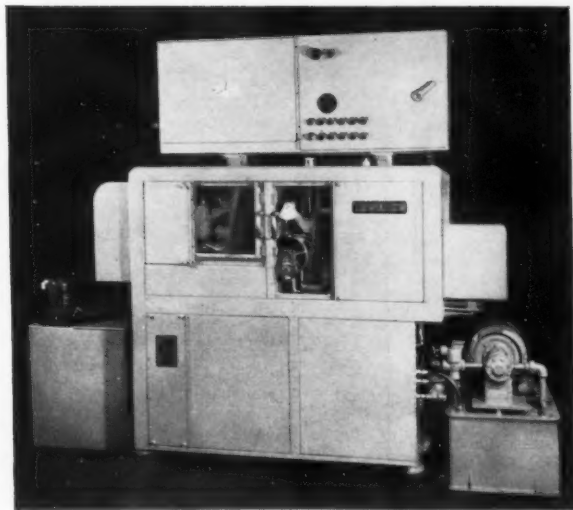


**CENTALIGN** offers more than any other internal grinder!



Exclusive anti-friction pre-loaded ball slide construction, incorporating both traverse and cross-feed motion.

## The Key to higher, more accurate production!



In day after day production, the Bryant Centalign\* has proved itself to be the fastest precision internal grinder ever built.

Compare the Centalign and its completely new design with any other internal grinder. Your analysis will show that only the Centalign offers these and other important features which result in higher production and increased accuracy:

- Wheelslide construction with grinding forces directly opposed on the same plane in which they are applied. Deflection caused by cantilevers is completely eliminated.
- Split-second cycle control by a simple cam unit which may be quickly adjusted when cycle changes are required. The complete unit may also be stored, and interchanged as a pre-set program.
- Simple servo-controlled hydraulic actuation of the wheelslide traverse. Power is applied directly on the center line of the wheelslide, avoiding objectionable side forces.

The Centalign is available in standard models for grinding straight bores, tapered bores or forms such as ball tracks. For high production contour bore grinding, custom-designed vertical Centaligns are available.

Write today for complete information.

\*T. M. Reg. U. S. Pat. Off., The Bryant Chucking Grinder Co.

# **BRYANT Chucking Grinder Co.**

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Offices: Indianapolis • Cleveland • Chicago • Detroit • Mt. Vernon, N. Y. • Philadelphia

Internal Grinders • Internal & External Thread Gages • Granite Surface Plates • Magnetic Drums for Computers • Special Machinery

For more information fill in page number on Inquiry Card, on page 237

MACHINERY, October, 1957—305

**CONTOUR FOLLOWER**—See Tracing Attachments**CONTRACT WORK**

Baker Brothers, Inc., 1000 Post St., Toledo 10, Ohio.  
 Bliss, E. C., Co., 1375 Raff Rd., S. D., Canton, Ohio.  
 Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio.  
 Eisler Engrg. Co., 750 S. 13th St., Newark 3, N. J.  
 Hartford Special Machinery Co., 287 Homestead St., Hartford, Conn.  
 Kearney & Trecker Corp., Milwaukee 14, Wis.  
 Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.  
 National Acme Co., 170 E. 131st St., Cleveland, Ohio.  
 Van Keuren Co., Watertown, Mass.

**CONTROLLERS**

Allen-Bradley Co., 1331 S. 1st St., Milwaukee, Wis.  
 Allis-Chalmers Mfg. Co., Milwaukee, Wis.  
 General Electric Co., Schenectady, N. Y.

**CONTROL SHAFTS**—See Lead-screws & Splines, Ball Bearing**CONVEYORS FOR DUST, CHIPS, ETC.**

Barnes, W. F. & John Co., Rockford, Ill.  
 Indiana Commercial Filters Corp., 28 South Ave., Lebanon, Ind.

**COPPER**

American Brass Co., 25 Broadway, New York, N. Y.

Mueller Brass Co., Port Huron 35, Mich.  
 Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

**COUNTERBORES AND COUNTERSINKS**

Chicago-Latrobe, 411 W. Ontario St., Chicago 10, Ill.  
 Circular Tool Co., Inc., 765 Allens Ave., Providence 5, R. I.  
 Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.  
 DoAll Co., Des Plaines, Ill.  
 Ex-Cell-O Corp., 120 Oakman Blvd., Detroit 32, Mich.  
 Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York  
 Heller Tool Co., Newcomerstown, Ohio.  
 National Twist Drill & Tool Co., Rochester, Mich.  
 Scully-Jones & Co., 1906 Rockwell St., Chicago 8, Ill.  
 Threadwell Tap & Die Co., 16 Arch St., Greenfield, Mass.  
 Wesson Co., 1220 Woodward Heights Blvd., Detroit 20, Mich.  
 Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mass.

**COUNTERS**

Starrett, The L. S., Co., Athol, Mass.

**COUPLINGS**

Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.  
 Boston Gear Works, 14 Hayward St., Quincy 7, Mass.  
 James, D. O., Gear Mfg. Co., 1140 W. Monroe St., Chicago 7, Ill.  
 Mueller Brass Co., Port Huron, Mich.  
 Philadelphia Gear Works, Erie Ave., and G Sts., Philadelphia, Pa.  
 Schroeder's Sons, A., 470 Vanderbilt Ave., Brooklyn 38, N. Y.  
 Standard Pressed Steel Co., Jenkintown, Pa. (Shaft)  
 Thor Power Tool Co., Prudential Plaza, Chicago 1, Ill.  
 Walker Co., Inc., O. S., Rockdale St., Worcester, Mass.

**CRANES, Electric Traveling**

Cleveland Crane & Engrg. Co., Wickliffe, Ohio.

**CUTTERS, Keyseating**

Baker Brothers, Inc., 1000 Post St., Toledo 10, Ohio.  
 Davis Keyseater Co., 405 Exchange St., Rochester 8, N. Y.  
 DoAll Co., Des Plaines, Ill.  
 du Mont Corp., Greenfield, Mass.  
 Mitts & Merrill, 1009 So. Water St., Saginaw, Mich.  
 National Twist Drill Co., Rochester, Mich.  
 Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

**CUTTERS, Milling**

Apex Tool & Cutter Co., Inc., 235 Canal St., Shelton, Conn.  
 Barber-Colman Co., 1300 Rock St., Rockford, Ill.  
 Brown & Sharpe Mfg. Co., Providence, R. I.  
 Chicago-Latrobe, 411 W. Ontario St., Chicago 10, Ill. (End mills)  
 Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.  
 DoAll Co., Des Plaines, Ill.  
 Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
 Gorton, George, Mch. Co., 1321 Racine St., Racine, Wis.  
 Hanson-Whitney Co., 169 Bartholomew Ave., Hartford 3, Conn. (dial, thread)  
 Haynes Stellite Co., Kokomo, Ind.  
 Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.  
 Kearney & Trecker Corp., Milwaukee, Wis.  
 Kennametal, Inc., Latrobe, Pa.  
 Lovejoy Tool Co., Inc., Springfield, Vt.  
 Metallurgical Products Dept. of General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.  
 National Twist Drill & Tl. Co., Rochester, Mich.  
 Onsrud Machine Works, Inc., Niles, Ill.  
 Tomkins-Johnson Co., Jackson, Mich.  
 Vascology-Ramet Corp., Waukegan, Ill.  
 Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

**SHELDON** U.S.A.  
CHICAGO  
*Variable Speed*  
**PRECISION LATHES**

A new series of 11" and 13" Precision lathes with . . .  
 toolroom accuracy . . . spindle speeds to 2,000 r.p.m. . . .  
 instant and automatic selection of speeds . . . increased  
 horsepower to spindle . . . and a full range of toolroom and  
 production accessories for greater versatility.

**Write for This New Bulletin!**  
 complete specifications . . . detailed explanation  
 of new variable drive . . . information on many  
 new production accessories.

**SHELDON MACHINE CO., INC.**  
 4246 N. Knox Ave., Chicago 41, Ill.

# Cost-wise design calls for **STANDARDIZED** **BOSTON** *gear* **SPEED REDUCERS**

**FROM STOCK!**

**BOSTON GEAR**  
Standardized  
Speed Reducers  
take top-rating  
in any test.  
Why pay more,  
— why wait,  
for "specials?"



**LASTING POWER ECONOMY**, long wear, easy maintenance and quiet operation make Boston Gear Speed Reducers the practical choice for drives in materials handling equipment. A 100 Series Model T Reducer is used in the conveyor drive illustrated, where production of 4,000,000 lamp bases per day requires continuous, trouble-free operation.



**COST OF SPECIAL MACHINES IS MUCH LESS** when designed around Boston Gear Standardized stock components. A 100 Series Model VMW Ratiomotor drives this automatic stripping and soldering machine for fuse plug lead wires. Assembly also includes standard stock Boston spur gears, rack, pillow blocks, pulleys, sheaves, and bushings.

**1605**  
TYPES and RATIOS  
**FROM STOCK**

## REDUCERS



Ratios  
1:1 to 3600:1  
.004 to 50 HP

## RATIOMOTORS

Output RPM .49 to 175

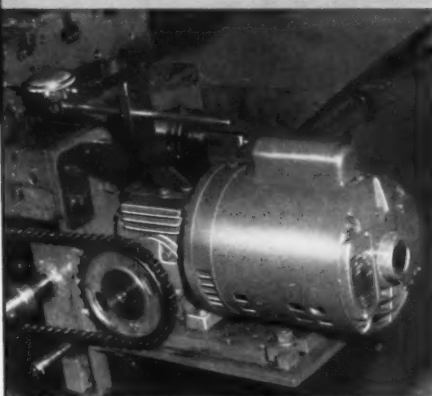


## FLANGED REDUCERS

Ratiomotor gear assemblies, sold without motor. You buy and attach your choice of motor.



Catalog No. 56 lists complete specifications — selection data



**INCREASED COOLING EFFICIENCY** of the finned housings of Boston Gear Speed Reducers dissipates heat rapidly. This permits compact design and higher torque capacity, of special advantage in machine tool drives like the 100 Series Model M Ratiomotor illustrated, and where space is limited, or where high area temperatures prevail.



**STANDARDIZED VARIABLE SPEED DRIVES**, assembled from Boston Gear stock parts, simplify the design job, and save the time required to procure special equipment. The illustration shows a Boston Gear Variable Speed assembly with a Type TW Reducer, used with Boston stock sprockets and chain to drive conveyor belt of a heat-treating furnace.

Your nearby Boston Gear Distributor can furnish any model you need, *from stock*. His factory-trained specialists will advise you on selection to simplify design and assure maximum economy. Be cost-wise . . . **STANDARDIZE and SAVE**. Boston Gear Works, 65 Hayward St., Quincy 71, Mass.

CALL  
YOUR

**BOSTON** *gear*  
**DISTRIBUTOR**



**7124 "OFF-THE-SHELF" TRANSMISSION PRODUCTS FROM STOCK** — AT FACTORY PRICES — ASK FOR CATALOG  
Stock Gears • Sprockets and Chain • Speed Reducers • Bearings • Pillow Blocks • Couplings



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Cincinnati Milling and Grinding Mchs., Inc., Cincinnati 9, Ohio.  
Cities Service Oil Co., 70 Pine St., New York, N. Y.

DoAll Co., Des Plaines, Ill.  
Oakite Products, Inc., 26 Rector St., New York 6, N. Y.  
Shell Oil Co., 50 W. 50th St., New York, N. Y.  
Sinclair Refining Co., 600 Fifth Ave., New York, N. Y.  
Stuart, D. A. Oil Co. Ltd., 2727 S. Troy St., Chicago 23, Ill.  
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.  
Texas Co., 135 E. 42nd St., New York, N. Y.

**CUTTING-OFF MACHINES, Lathe Type**

Bardons & Oliver, Inc., 1133 West Ninth St., Cleveland 13, Ohio.  
Brown & Sharpe Mfg. Co., Providence, R. I.

Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio.  
Cone Automatic Mch. Co., Windsor, Vt.  
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
Modern Machine Tool Co., Jackson, Mich.

**CUTTING-OFF SAWS, Abrasive Wheel**

Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.  
DoAll Co., Des Plaines, Ill.  
Norton Co., 1 New Bond St., Worcester 6, Mass.  
Simonds Abrasive Co., Tacony & Fraley Sts., Philadelphia 35, Pa.  
Wallace Supplies Mfg. Co., 1308 Diversey Parkway, Chicago 14, Ill.

**CUTTING TOOLS—See Tool Material****CYLINDERS, Air**

Cushman Chuck Co., 806 Windsor St., Hartford 2, Conn.  
Hannifin Corp., 501 Wolf Rd., Des Plaines, Ill.

Hydraulic Press Mfg. Co., Mt. Gilead, Ohio.  
Logansport Mch. Co., Inc., Logansport, Ind.  
Thompson Products, Inc., Warren, Mich.  
Tomkins-Johnson Co., Jackson, Mich.

**CYLINDERS, Hydraulic**

Barnes, John S., Corp., 301 S. Water St., Rockford, Ill.  
Chicago Pneumatic Tool Co., New York 17, N. Y.  
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.  
Hydraulic Press Mfg. Co., Mt. Gilead, Ohio.  
Logansport Machine Co., Inc., Logansport, Ind.  
Oilgear Co., 1569 W. Pierce St., Milwaukee Wis.  
Thompson Products, Inc., Warren, Mich.  
Vickers, Inc., Detroit 32, Mich.  
Wilson, K. R., Inc., Arcade, N. Y.

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Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.  
Modern Industrial Eng. Co., 14230 Birwood Ave., Detroit 38, Mich.  
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, Ohio.  
Sheffield Corp., Box 893, Dayton 1, Ohio.  
Wallace Supplies Mfg. Co., 1308 Diversey Parkway, Chicago 14, Ill.

**DEMAGNETIZERS**

Blanchard Mch. Co., 64 State St., Cambridge, Mass.  
Lufkin Rule Co., Saginaw, Mich.

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Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio.  
Hydraulic Press Mfg. Co., Mount Gilead, Ohio.  
Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.

**DIE CUSHIONS**

Bliss, E. W. Co., 1375 Raff Rd., S. W., Canton, Ohio.  
Clearing Mch. Corp., 6499 W. 65th St., Chicago, Ill.  
Danly Mch. Specialties, Inc., 2100 S. Laramie, Chicago 50, Ill.  
Dayton Rogers Mfg. Co., Minneapolis, Minn.  
Federal Machine & Welder Co., Overland Ave., Warren, Ohio.  
Minster Mch. Co., Minster, Ohio.  
Verson Allsteel Press Co., 93rd St., and S. Kenwood Ave., Chicago, Ill.

**DIEING MACHINES**

Pratt & Whitney Co., Inc., West Hartford, Conn.

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Allegheny Ludlum Steel Corp., Pittsburgh, Pa.  
Kennametal Inc., Latrobe, Pa.  
Metallurgical Products Dept. of General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.  
Vascoloy-Ramet Corp., Waukegan, Ill.

**DIE SETS AND DIEMAKERS' SUPPLIES**

Bliss, E. W. Co., 1375 Raff Rd., S. W., Canton, Ohio.  
Danly Mch. Specialties, Inc., 2100 S. Laramie, Chicago 50, Ill.  
Producto Mch. Co., 985 Housatonic Ave., Bridgeport 1, Conn.  
U. S. Tool Co., Inc., 255 North 18th St., Amherst, N. J.  
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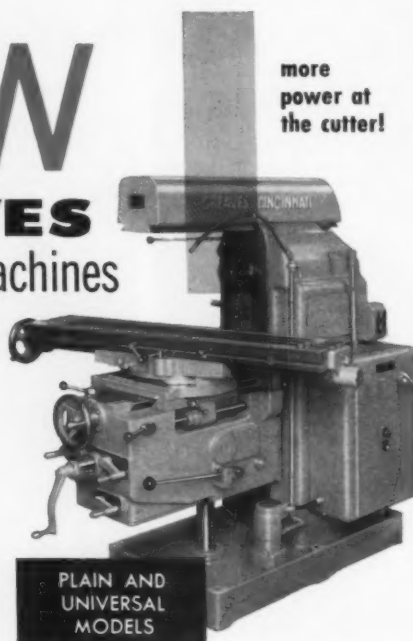
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Ferracute Mch. Co., Bridgeton, N. J.  
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Metallurgical Products Dept. of General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.  
Moore Special Tool Co., Inc., 740 Union Ave., Bridgeport 7, Conn.  
Niagara Mch. & Tool Wks., 637 Northland Ave., Buffalo 11, N. Y.  
Olafsson Corp., Lansing, Mich.  
Ryerson & Son, Inc., Jas. T., 16th & Rockwell Sts., Chicago 8, Ill.  
Vascoloy-Ramet Corp., Waukegan, Ill.  
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Greenfield Tap & Die Corp., Greenfield, Mass.  
Jones & Lamson Mch. Co., Springfield, Vt.  
Landis Mch. Co., Waynesboro, Pa.  
National Acme Co., 170 E. 131st St., Cleveland, Ohio

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**DIES, Thread Rolling**

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DoAll Co., Des Plaines, Ill.  
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Hamilton Tool Co., 834 S. 9th St., Hamilton, Ohio  
Hoglund Eng. & Mfg. Co., Inc., Berkeley Hts., N. J.

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Metallurgical Products Dept. of General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.  
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Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.  
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio

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DoAll Co., Des Plaines, Ill.  
Scully-Jones & Co., 1906 S. Rockwell St., Chicago 8, Ill.  
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

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Avey Drilling Machine Co., 25 East Third St., Covington, Ky.  
Baker Brothers, Inc., 1000 Post St., Toledo 10, Ohio  
Barnes Drill Co., 814 Chestnut, Rockford, Ill.  
Baush Machine Tool Co., 15 Wason Ave., Springfield, Mass.  
Buffalo Forge Co., Broadway, Buffalo, N. Y.  
Cross Co., 3250 Bellevue, Detroit 7, Mich.  
Davis & Thompson Co., 4460 N. 124th St., Milwaukee 10, Wis.  
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh, Pa.  
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, Staten Island, N. Y.  
Etico Tool Co., Inc., 594 Johnson Ave., Brooklyn, N. Y.  
Hartford Special Machinery Co., 387 Homestead Ave., Hartford, Conn.  
Kearney & Trecker Corp., Milwaukee 14, Wis.  
La Salle Tool, Inc., 3840 E. Outer Drive, Detroit 34, Mich.  
Leland Gifford Co., Box 989, Worcester 1, Mass.  
National Automatic Tool Co., Richmond, Ind.  
Snyder Tool & Engrg. Co., 3400 Lafayette, Detroit 7, Mich.  
Thrifmaster Products Corp., 1076 N. Plum St., Lancaster, Pa.  
United States Drill Head Co., 616 Burns, Cincinnati, Ohio

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Delta Power Tool Div., Rockwell Mfg. Co., Pittsburgh, Pa.  
Hartford Special Machinery Co., 287 Homestead Ave., Hartford 12, Conn.  
Kingsbury Mch. Tool Corp., Keene, N. H.  
Snow Manufacturing Co., Bellwood, Illinois

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DoAll Co., Des Plaines, Ill.  
Greenfield Tap & Die Corp., Greenfield, Mass.  
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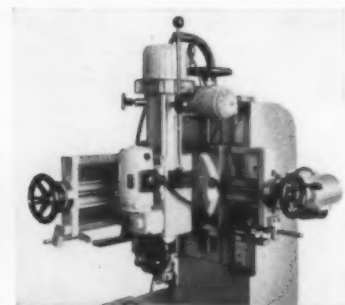
Avey Drilling Machine Co., 25 East Third St., Covington, Ky.  
Baker Brothers, Inc., 100 Post St., Toledo 10, Ohio  
Barnes, W. F. & John Co., Rockford, Ill.  
Baush Machine Tool Co., 15 Wason Ave., Springfield, Mass.  
Buhr Machine Tool Co., 839 Green St., Ann Arbor, Mich.  
Cross Co., 3250 Bellevue, Detroit 7, Mich.  
Etico Tool Co., Inc., 594 Johnson Ave., Brooklyn 37, N. Y.  
Govro-Nelson Co., 1831 Antoinette St., Detroit 8, Mich.  
Hartford Special Machinery Co., 287 Homestead Ave., Hartford, Conn.  
Homstrand, Inc., Larchmont, N. Y.  
Kaukauna Machine & Foundry Div., Giddings & Lewis Machine Tool Co., Kaukauna, Wis.  
Kearney & Trecker Corp., Milwaukee 14, Wis.  
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(Continued on page 312)

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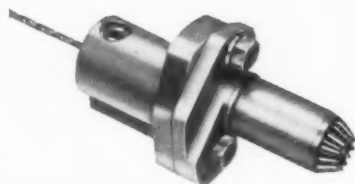


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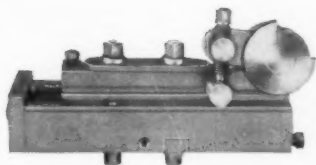
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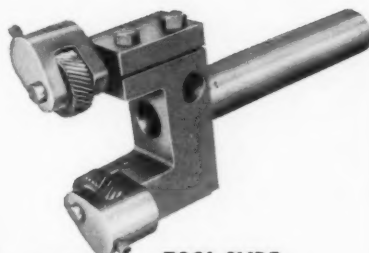
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This tool holder, made for circular tools, can be used on the front or rear cross-slide of multi-spindle automatics . . . It is made to operate within the capacity of the machine.



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 Western Machine Tool Works, Holland, Mich.

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 Barnes, W. F. & John Co., Rockford, Ill.  
 Baush Machine Tool Co., 15 Wason Ave., Springfield, Mass.  
 Bodine Corp., 317 Mt. Grove St., Bridgeport 5, Conn.

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
 Cross Co., 3250 Bellevue, Detroit 7, Mich.  
 Davis & Thompson Co., 4460 N. 124th St., Milwaukee 10, Wis.  
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 Hartford Special Machinery Co., 287 Homestead Ave., Hartford, Conn.  
 Kearney & Trecker Corp., Milwaukee 14, Wis.  
 Kingsbury Mch. Tool Corp., Keene, N. H.  
 LaSalle Tool, Inc., 3840 E. Outer Dr., Detroit 34, Mich.  
 Leland-Gifford Co., Box 989, Worcester 1, Mass.  
 Le Maire Tool & Mfg. Co., Dearborn, Mich.  
 Modern Industrial Eng. Co., 14230 Birwood Ave., Detroit 38, Mich.  
 Moline Tool Co., Moline, Ill.  
 National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.  
 Olofsson Corp., Lansing, Mich.  
 Russell, Holbrook & Henderson, Inc., 292 Madison Ave., New York 17, N. Y.

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 Wales-Strippit Corp., Akron, N. Y.

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 Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh, Pa.  
 Edlund Machinery Co. Div., Cortland, N. Y.  
 Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio  
 Hamilton Tool Co., 834 S. 9th St., Hamilton, Ohio  
 Hartford Special Machinery Co., 287 Homestead Ave., Hartford, Conn.  
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 Hartford Special Machinery Co., 287 Homestead Ave., Hartford, Conn.  
 Leland-Gifford Co., Box 989, Worcester 1, Mass.  
 National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.  
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 Wales-Strippit Corp., Akron, N. Y.

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 Barnes, W. F. & John Co., Rockford, Ill.  
 Baush Machine Tool Co., 15 Wason Ave., Springfield, Mass.  
 Bodine Corp., 317 Mt. Grove St., Bridgeport 5, Conn.  
 Cincinnati Bickford Div., Oakley, Cincinnati, Ohio  
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 Consolidated Mch. Tool Corp., Rochester, N. Y.  
 Davis & Thompson Co., 4460 124th St., Milwaukee 10, Wis.  
 Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh, Pa.  
 Edlund Machinery Co. Div., Cortland, N. Y.  
 Foote-Burr Co., 1300 St. Clair Ave., Cleveland, Ohio  
 Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio  
 Greenlee Bros. & Co., 136 12th St., Rockford, Ill.  
 Hamilton Tool Co., 834 So. 9th St., Hamilton, Ohio  
 Hartford Special Machinery Co., 287 Homestead Ave., Hartford, Conn.  
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 Leland-Gifford Co., Box 989, Worcester, Mass.  
 Le Maire Tool & Mfg. Co., Dearborn, Mich.  
 Modern Industrial Eng. Co., 14230 Birwood Ave., Detroit 38, Mich.  
 Moline Tool Co., Moline, Ill.  
 National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.  
 Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.  
 South Bend Lathe Works, South Bend 22, Ind.  
 Western Machine Tool Works, Holland, Mich.

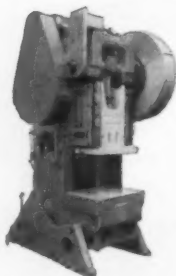
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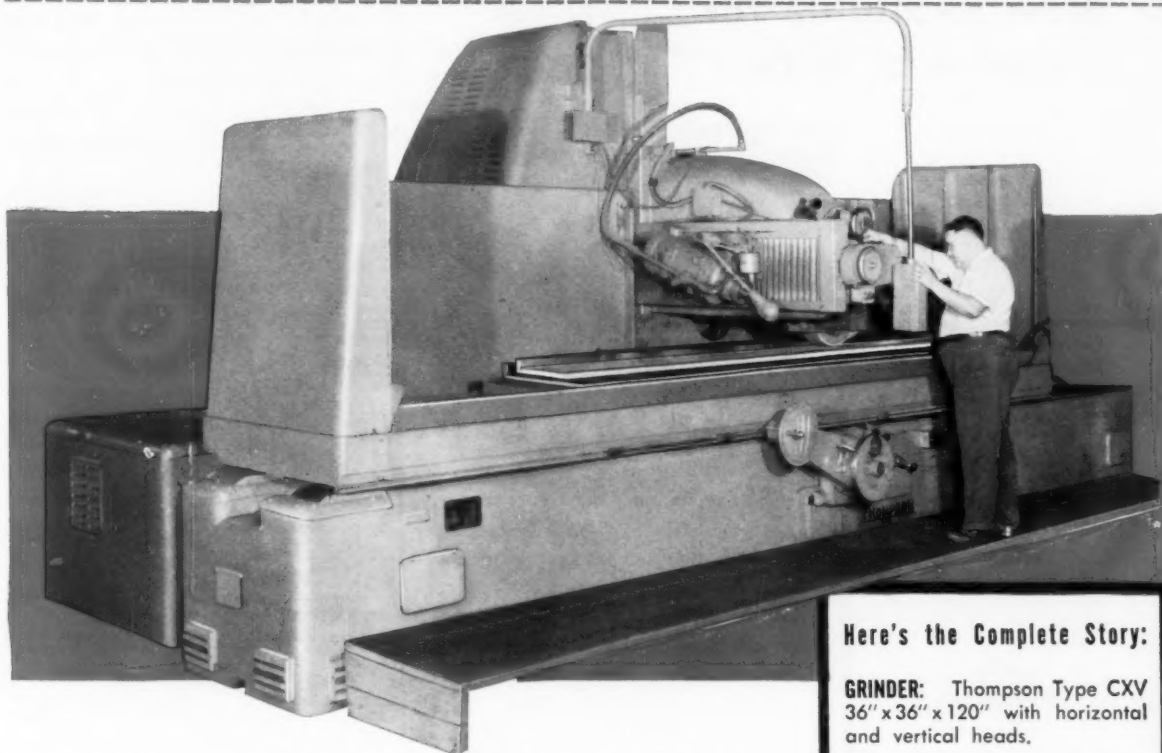
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Wire or phone for list of presses immediately available.

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**When large parts must be ground  
to total tolerances of .0005" or less . . . .  
THOMPSON GRINDERS WITH THE NEW  
HYDRA-COOL HYDRAULIC SYSTEM SOLVE THE PROBLEM!**



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Hydra-Cool also offers you these exclusive advantages:

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*Hydra-Cool is standard on all Thompson surface grinders  
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**THE THOMPSON GRINDER CO., Springfield, Ohio, U. S. A.**

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**"Keep THOMPSON in mind for that daily grind"**

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**Here's the Complete Story:**

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36" x 36" x 120" with horizontal  
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**PART:** 118" way for Michigan  
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**MATERIAL  
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**METAL:** Flame hardened Ductile  
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**WHEEL:** 20x4x12 H Grade.

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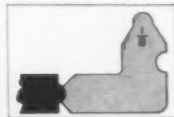
Convenience and Adaptability Have Made Lufkin the First Choice in Radius Gages



1. Determines radius of inside corner and if sides are 90°.



2. Determines radius of outside corner and if sides are 90°.



3. Determines convex radius near projection that prevents use of gage as in views 2 and 5.



4. Checks any concave radius that is 1/2 or less of circle.



5. Checks 1/2 of a circumference.

This style radius gage, preferred by toolmakers, diemakers, patternmakers, inspectors, layout men and others, is now available in a complete range of sizes up to 2".

With a design pioneered and developed by Lufkin, each gage is a separate unit with five different gaging applications for use on both concave and convex radii. The gaging surfaces have smooth, accurately machined edges, and the sides of the blade have a polished, natural metal finish.

Available in sets as listed below or by individual gage. Sets are packaged in durable folding cases of heavy red vinyl, fitted with pockets for each edge.

- No. 77A 16 gages 1/32 to 1 1/4 by 64ths
- No. 77AX 17 gages 1/64 to 1 1/4 by 64ths and No. 20 Holder
- No. 77B 8 gages 1/32 to 1/2 by 32nds
- No. 77C 24 gages (Sets 77A and 77B Combined)
- No. 77CX 25 gages (Sets 77AX and 77B Combined)
- No. 77D 16 gages 1/32 to 1/2 by 32nds
- No. 77E 8 gages 1/4 to 1 by 16ths
- No. 77F 8 gages 1/8 to 2 by 8ths
- No. 77G 16 gages 1 1/4 to 2 by 16ths

BETTER MEASURE WITH **LUFKIN**  
TAPES • RULES • PRECISION TOOLS

THE LUFKIN RULE CO., Saginaw, Michigan

473

IT PAYS TO USE YOUR INDUSTRIAL DISTRIBUTOR  
... He can simplify your purchasing

### DRILLING MACHINES, Radial

Aaron Machinery Co., Inc., 45 Crosby St., New York 12, N. Y.  
American Tool Works Co., Pearl and Eggleston Ave., Cincinnati, Ohio  
Carlton Mch. Tool Co., 2961 Meeker St., Cincinnati 25, Ohio  
Cincinnati Bickford Div., Oakley, Cincinnati, Ohio  
Cincinnati Gilbert Machine Tool Co., 3366 Beekman St., Cincinnati 23, Ohio  
Cincinnati Lathe & Tool Co., Marburg Ave., Cincinnati 9, Ohio  
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., Cleveland 14, Ohio  
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
Foote-Burt Co., 1300 St. Clair Ave., Cleveland, Ohio  
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio  
Hartford Special Machinery Co., 287 Homestead Ave., Hartford, Conn.  
Onsrud Machine Works, Inc., Niles, Ill.  
Russell, Holbrook & Henderson, Inc., 292 Madison Ave., New York 17, N. Y.  
Western Machine Tool Works, Holland, Mich.

### DRILLING MACHINES, Sensitive

Atlas Press Co., 20108 N. Pitcher, Kalamazoo, Mich.  
Avey Drilling Machine Co., 25 East Third St., Covington, Ky.  
Baker Brothers, Inc., 1000 Post St., Toledo 10, Ohio  
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.  
Cincinnati Bickford Div., Oakley, Cincinnati, Ohio  
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Cincinnati 9, Ohio  
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh, Pa.  
Edlund Machinery Co. Div., Cortland, N. Y.  
Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio  
Fosdick Mch. Tool Co., 1638 Blue Rock St., Cincinnati 23, Ohio  
Hamilton Tool Co., 834 S. 9th St., Hamilton, Ohio  
Henry & Wright Div., Hartford, Conn.  
Leland-Gifford Co., Box 989, Worcester, Mass.  
Levin & Son, Inc., 3610 So. Broadway, Los Angeles, Calif.  
National Automatic Tool Co., Inc., S. 7th and N. St., Richmond, Ind.  
Snow Manufacturing Co., Bellwood, Illinois  
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.  
Townsend, H. P. Mfg. Co., Elmwood, Conn.  
Wales-Stripp Corp., Akron, N. Y.  
Western Machine Tool Works, Holland, Mich.

### DRILLING MACHINES, Universal Radial

Kaukauna Machine & Foundry Div., Giddings & Lewis Machine Tool Co., Kaukauna, Wis.

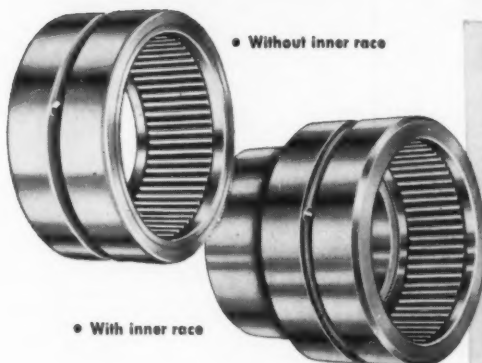
### DRILLING MACHINES, Upright

Aaron Machinery Co., Inc., 45 Crosby St., New York 12, N. Y.  
Avey Drilling Machine Co., 25 East Third St., Covington, Ky.  
Baker Brothers, Inc., 1000 Post St., Toledo 10, Ohio  
Barnes, W. F. & John Co., Rockford, Ill.  
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.  
Canton Tool Mfg. Co., E. Canton, Ohio  
Cincinnati Bickford Div., Oakley, Cincinnati, Ohio  
Cincinnati Lathe & Tool Co., Marburg Ave., Cincinnati 9, Ohio  
Cleereman Machine Tool Co., Green Bay, Wis.  
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
Etco Tool Co., Inc., 594 Johnson Ave., Brooklyn 37, N. Y.  
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio  
Hartford Special Machinery Co., 287 Homestead Ave., Hartford, Conn.

(Continued on page 316)

# ORANGE NEEDLE BEARINGS

- offer widest choice of types and sizes to match your design needs
- greater opportunity to simplify design—fight friction—meet load requirements—save space and cost.



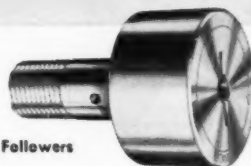
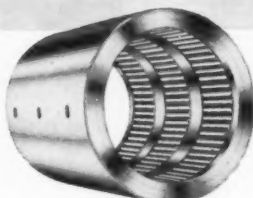
## ORANGE *Full Type* ROLLER BUSHINGS

Maximum load capacity in small space

Orange Roller Bushings are full-type needle bearings for heavy-duty service. Rollers and races made of finest bearing steel—hardened, ground and finished to highest precision standards for durable, friction-free operation. Exact control of roller uniformity by electronic gauging, permits closer internal running clearances, minimizing possibility of misaligned rollers. Complete range of stock sizes from  $\frac{1}{2}$ " to 8" shaft diameters.



• Two and three row types for extra heavy duty



• Cam Followers

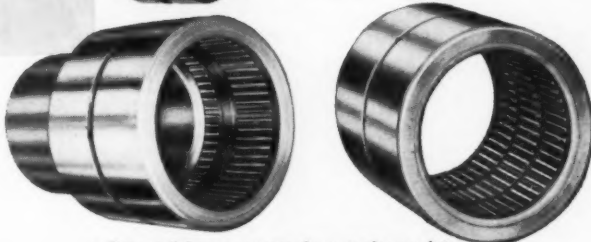
## ORANGE *Cage Type* NEEDLE BEARINGS

Permanent alignment of rollers prevents skewing

Anti-friction cage keeps rollers permanently aligned and true-running in any position—vertical, tilted, horizontal. Successful on overhung mountings and relatively high-speed installations. Less affected by misaligned mountings or uneven loading. Extremely smooth, quiet running. The answer to many applications unsuited for conventional needle bearings. Wide choice of sizes from  $\frac{1}{2}$ " to 8" diameter.



• Sealed Type with built-in seal eliminates need for seals in housing



• Two and three row types for extra heavy duty



WRITE for new 40-page Engineering Reference Manual M-55 giving complete details of construction, dimensions, capacities, etc.

ORANGE ROLLER BEARING CO., INC., 552 Main Street, Orange, N. J.

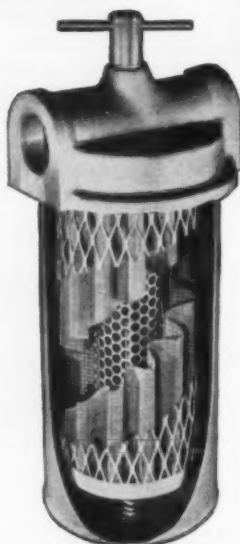


# Simplify Preventive Maintenance on Hydraulic Equipment with **MARVEL SYNCLINAL FILTERS**



SUMP TYPE (cutaway)

Change excessive  
and costly  
"DOWN-TIME"  
to  
Profitable  
"OPERATING TIME"



LINE TYPE (cutaway)

Any workman can easily disassemble, thoroughly clean and re-assemble MARVEL Synclinal FILTERS, on the spot, in a matter of minutes. RESULT:—The equivalent of a brand new filter, ready for longer periods of dependable service and protection. MARVEL Synclinal FILTERS are "permanent type" filters because there are no throw-away parts to buy or replace, no moving parts to wear out or break down. Your FIRST COST is your ONLY COST.

Marvel's BALANCED Synclinal design offers 2½ times more ACTIVE filtering area with sufficient storage capacity for filtered-out damaging particles; thus, longer periods of productive operation are attained at a minimum filter maintenance "down-time."

You can further simplify your preventive maintenance program by standardizing with MARVEL Synclinal FILTERS, by specifying them on all new equipment and installing them on existing equipment.

**FOR EFFICIENT FILTRATION of Hydraulic Oils, Fire-resistant Fluids, Coolants, Lubricants, Water—**

**and**  
**FOR DEPENDABLE PROTECTION on all Hydraulic and other Low Pressure Circulating Systems—**  
**investigate MARVEL SYNCLINAL FILTERS**

**OVER 750 Original Equipment Manufacturers  
install MARVEL SYNCLINAL FILTERS as Standard Equipment!**

**A SIZE FOR EVERY NEED**

Available for sump or line installation in capacities from 5 to 100 G.P.M. Greater capacities may be attained by multiple installation (as described in catalog). Choice of monel mesh sizes range from coarse 30 to fine 200.

## IMMEDIATE DELIVERY!

Catalogs contain complete engineering data and dimensional charts making it easy to order a filter for your specific requirements and get immediate delivery.

## MARVEL ENGINEERING COMPANY

7227 N. Hamlin Ave., Chicago 45, Ill.

PHONE Juniper 8-6023

Without obligation, please send me complete data on Marvel Synclinal Filters, as indicated—

- ☐ Catalog #106—For Hydraulic Oils, Coolants, Lubricants.
- ☐ Catalog #200—For Fire-resistant Hydraulic Fluids (Aqueous Base)
- ☐ Catalog #400—For Fire-resistant Hydraulic Fluids (Synthetic).
- ☐ Catalog #301—For Water

MY-10

Name .....

Company .....

Address .....

City .....

State .....

Homestrand, Inc., Larchmont, N. Y.  
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.  
Le Maire Tool & Mfg. Co., Dearborn, Mich.  
National Automatic Tool Co., Inc., S. 7th and N. St., Richmond, Ind.  
Rehnberg-Jacobson Mfg. Co., 2135 Kishwaukee St., Rockford, Ill.  
Snow Manufacturing Co., Bellwood, Ill.  
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.  
Wales Strippit Corp., Akron, N. Y.  
Western Machine Tool Works, Holland, Mich.

## DRILLS, Center

Chicago-Latrobe, 411 W. Ontario St., Chicago 10, Ill.  
Circular Tool Co., Inc., 765 Allens Ave., Providence 5, R. I.  
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio  
DoAll Co., Des Plaines, Ill.  
Greenfield Tap & Die Corp., Greenfield, Mass.  
National Twist Drill & Tool Co., Rochester, Mich.  
Threddwell Tap & Die Co., 16 Arch St., Greenfield, Mass.  
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

## DRILLS, Core

Ace Drill Corp., Adrian, Mich.  
Chicago-Latrobe, 411 W. Ontario St., Chicago 10, Ill.  
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio  
DoAll Co., Des Plaines, Ill.  
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
Greenfield Tap & Die Corp., Greenfield, Mass.  
Metallurgical Products Dept. of General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.  
National Twist Drill & Tl. Co., Rochester, Mich.  
Scully-Jones & Co., 1906 Rockwell St., Chicago 8, Ill.  
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.  
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

## DRILLS, Deep Hole, Gun

Ace Drill Corp., Adrian, Mich.  
Chicago-Latrobe, 411 W. Ontario St., Chicago 10, Ill.  
Greenfield Tap & Die Corp., Greenfield, Mass.  
National Twist Drill & Tl. Co., Rochester, Mich.  
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

## DRILLS, Oil Hole, Oil Tube

Chicago-Latrobe, 411 W. Ontario St., Chicago 10, Ill.  
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio  
DoAll Co., Des Plaines, Ill.  
Greenfield Tap & Die Corp., Greenfield, Mass.  
National Twist Drill & Tl. Co., Rochester, Mich.  
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

## DRILLS, Portable Electric

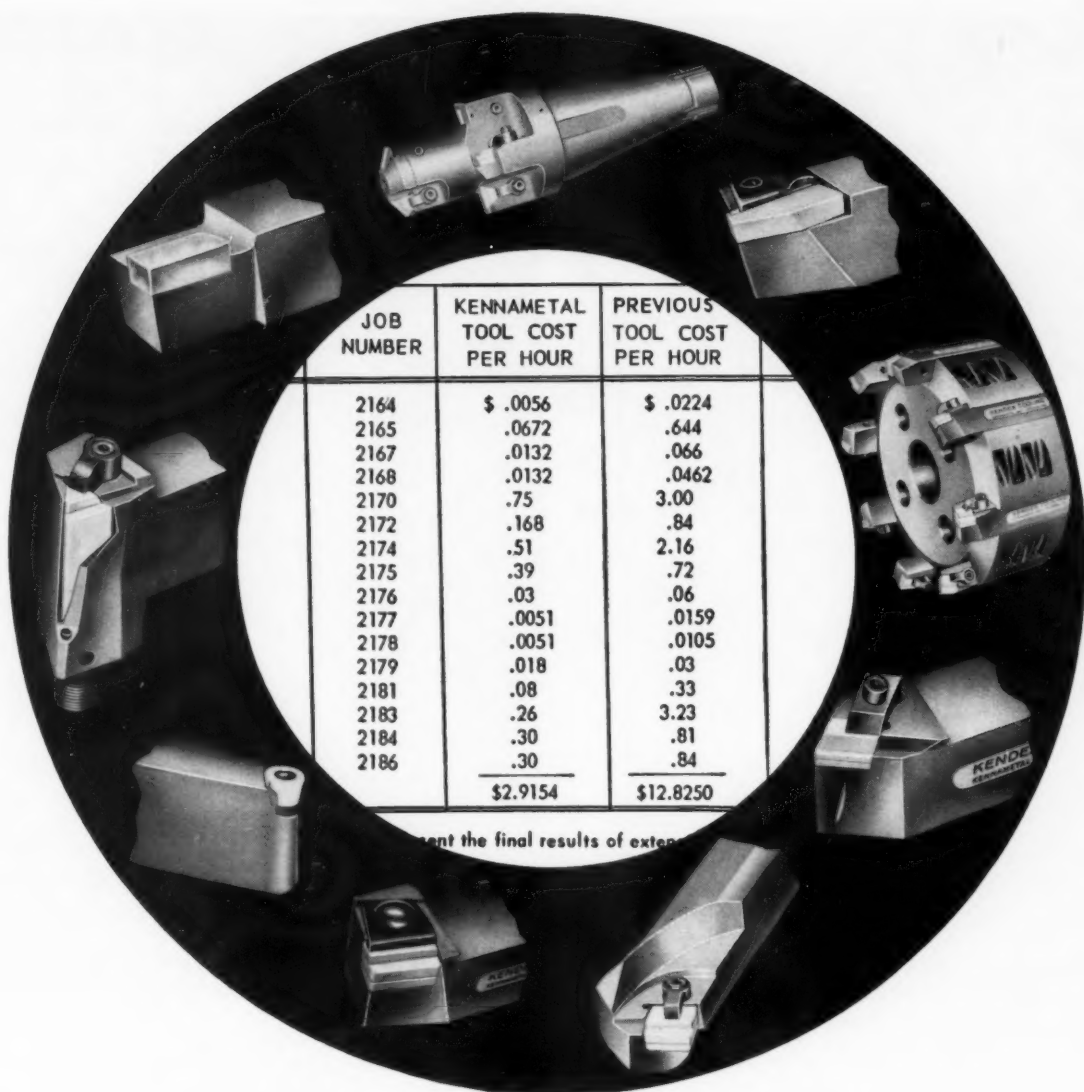
Chicago Pneumatic Tool Co., New York 17, N. Y.  
Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.  
Thor Power Tool Co., Prudential Plaza, Chicago 1, Ill.

## DRILLS, Portable Pneumatic

Chicago Pneumatic Tool Co., New York 17, N. Y.  
Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.  
Onsrud Machine Works, Inc., Niles, Ill.  
Thor Power Tool Co., Prudential Plaza, Chicago 1, Ill.



Catalogs  
containing  
complete data  
available  
on request



## It took KENNAMETAL\* Tooling—plus KENNAMETAL Tool Engineering Service—to get these results!

There's nothing much that words can add to the story told by the comparative cost figures above. On sixteen separate applications, Kennametal tool cost per hour (center column) totaled \$2.9154—less than one-fourth as much as the \$12.8250 cost for tools previously used (right hand column).

On this basis, the Kennametal tool cost of \$17,490 per year cut previous expense by \$59,460!

It takes a combination of quality

tools and *scientific* service to produce results like this. Kennametal has built its business upon this combination.

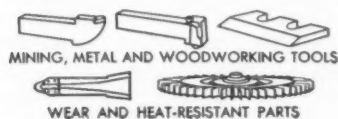
A Kennametal Tool Engineer will work with your personnel, in analyzing various machining jobs to get the best results on each operation. The extensive selection of standard Kennametal tooling usually provides the exact tool needed to handle the work . . . if not, he can make the proper recommendations.

When desirable, in-plant training courses can be conducted by Kennametal representatives to help your personnel in the selection, application and care of tools to get the most from your tool dollars.

We will be glad to give you full information on how Kennametal tools and Kennametal service can help you. Just write, outlining your particular problem, to KENNAMETAL Inc., Latrobe, Pennsylvania.

\*TRADEMARK

C-3088



INDUSTRY AND  
**KENNAMETAL**  
...Partners in Progress



**DRILLS, Ratchet**

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.  
Chicago-Latrobe, 411 W. Ontario St., Chicago 10, Ill.  
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio  
Greenfield Tap & Die Corp., Greenfield, Mass.  
National Twist Drill & Tool Co., Rochester, Mich.  
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

**DRILLS, Subland**

Ace Drill Corp., Adrian, Mich.  
Chicago-Latrobe, 411 W. Ontario St., Chicago 10, Ill.  
Cleveland Twist Drill Co., 1242 49th St., Cleveland 14, Ohio  
DoAll Co., Des Plaines, Ill.  
Greenfield Tap & Die Corp., Greenfield, Mass.  
National Twist Drill & Tool Co., Rochester, Mich.  
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

**DRILLS, Twist, High-Speed Steel, Carbon Steel**

Ace Drill Corp., Adrian, Mich.  
Chicago-Latrobe, 411 W. Ontario St., Chicago 10, Ill.  
Cleveland Twist Drill Co., 1242 49th St., Cleveland 14, Ohio  
DoAll Co., Des Plaines, Ill.  
Greenfield Tap & Die Corp., Greenfield, Mass.  
National Twist Drill & Tool Co., Rochester, Mich.  
Thor Power Tool Co., Prudential Plaza, Chicago 1, Ill.  
Threadwell Tap & Die Co., 16 Arch, Greenfield, Mass.  
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

**DRILLS, Twist, Carbide, Carbide-tipped**

Ace Drill Corp., Adrian, Mich.  
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh 22, Pa.  
Chicago-Latrobe, 411 W. Ontario St., Chicago 10, Ill.  
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio  
DoAll Co., Des Plaines, Ill.  
Heller Tool Co., Newcomerstown, Pa.  
National Twist Drill & Tool Co., Rochester, Mich.  
Thor Power Tool Co., Prudential Plaza, Chicago 1, Ill.  
Threadwell Tap & Die Co., 16 Arch St., Greenfield, Mass.  
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

**DRILLS, Wire**

Ace Drill Corp., Adrian, Michigan  
Chicago-Latrobe, 411 W. Ontario St., Chicago 10, Ill.  
Cleveland Twist Drill Co., Cleveland, O.  
Greenfield Tap & Die Corp., Greenfield, Mass.  
National Twist Drill & Tool Co., Rochester, Mich.  
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

**DUPLICATING ATTACHMENTS — See Tracing Attachments****DUST COLLECTORS AND CONTROL SYSTEMS**

Brown & Sharpe Mfg. Co., Providence, R. I.  
Pangborn Corp., Hagerstown, Md.  
Standard Electrical Tool Co., 2500 River Rd., Cincinnati 14, Ohio

**ELECTRICAL DISCHARGE MACHINES — See Disintegrators****ELECTROPLATING EQUIPMENT**

Wagner Brothers, Inc., 433 Midland Ave., Detroit 3, Mich.

**ENGRAVING MACHINES**

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
Gorton, Geo., Mach., 1321 Racine St., Racine Wis.  
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.

**EXPANDERS, Mechanical, Hydraulic**

Grottes Machine Wks., Inc., 5454 N. Walcott, Chicago 40, Illinois

**EXTRACTORS, Screw**

Chicago-Latrobe, 411 W. Ontario St., Chicago 10, Ill.  
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio  
Greenfield Tap & Die Corp., Greenfield, Mass.  
Walton Co., Hartford 10, Conn.  
Williams & Co., J. H., 400 Vulcan St., Buffalo 7, N. Y.

**FACING HEADS**

Baker Brothers, Inc., 1000 Post St., Toledo 10, Ohio  
Cross Co., 3250 Bellevue, Detroit 7, Mich.  
Davis Boring Tool Div., Giddings & Lewis Mach. Tool Co., Fond du Lac, Wis.  
G & L and Hypro Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.  
Hartford Special Machinery Co., 287 Homestead Ave., Hartford, Conn.  
Kaukauna Machine & Foundry Div., Giddings & Lewis Machine Tool Co., Kaukauna, Wis.  
Mummert-Dixon Co., Hanover, Pa.

**FANS, Exhaust, Ventilating**

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.

**FEEDERS, Automatic**

Perry Equipment & Eng. Co., Erie, Penna.  
Production Feeder Corp., Mentor, Ohio  
V & O Press Co., Hudson, New York

**FILES, Band**

DoAll Co., Des Plaines, Ill.

**FILES, General-purpose, Swiss Pattern**

DoAll Co., Des Plaines, Ill.  
Heller Tool Co., Newcomerstown, Ohio  
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.

**FILES AND BURRS, Rotary**

DoAll Co., Des Plaines, Ill.  
Heller Tool Co., Newcomerstown, Ohio  
Pratt & Whitney Co., Inc., West Hartford, Conn.  
Severance Tool Ind., Inc., Saginaw, Mich.  
Simonds Saw & Steel Co., Fitchburg, Mass.  
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

**FILING MACHINES**

Chicago Pneumatic Tool Co., New York 17, N. Y.  
DoAll Co., Des Plaines, Ill.  
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

**FILTERS, Coolant and Oil**

Barnes Drill Co., 814 Chestnut St., Rockford, Ill.  
Commercial Filters Corp., Lebanon, Ind.  
Industrial Filtration Co., 15 Industrial Ave., Lebanon, Ind.  
Marvel Engineering Co., 7227 N. Hamlin Ave., Chicago 45, Ill.

**FINISHES, Machine and Metal**

Lowe Bros. Co., Dayton, Ohio

**FLAME-HARDENING MACHINES**

Cincinnati Milling and Grinding Mchs., Inc., Cincinnati 9, Ohio  
Gleason Works, 100 University Ave., Rochester 3, N. Y.

**FORGING HAMMERS, Steam and Air**

Chambersburg Engrg. Co., Chambersburg, Pa.

**FORGING MACHINES, Headers, Upsetters, Presses**

Ajax Mfg. Co., 1441 Chardon Rd., Cleveland 17, Ohio  
Bliss, E. W. Co., 1375 Raff Rd. S. W., Canton, Ohio  
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio  
Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.  
National Machinery Co., Tiffin, Ohio

**FORGINGS, Drop**

Bethlehem Steel Co., 701 East Third St., Bethlehem, Pa.  
Crucible Steel Co. of America, Henry W. Oliver Bldg., Mellon Square, Pittsburgh 22, Pa.  
Mueller Brass Co., Port Huron 35, Mich.  
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.  
Wyman-Gordon Co., Worcester, Mass.

**FORGING, Hollow-Bored**

Bethlehem Steel Co., 701 East Third St., Bethlehem, Pa.  
Mueller Brass Co., Port Huron, Mich.

**FORGINGS, Press**

Bethlehem Steel Co., 701 East Third St., Bethlehem, Pa.  
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., Cleveland 14, Ohio  
Minster Mch. Co., Minster, Ohio  
Mueller Brass Co., Port Huron, Mich.  
Revere Copper & Brass, Inc., 230 Park Ave., New York 17, N. Y. (die-pressed)  
U. S. Steel Corp., Pittsburgh, Pa.  
Wyman-Gordon Co., Worcester, Mass.

**FORGINGS, Upset**

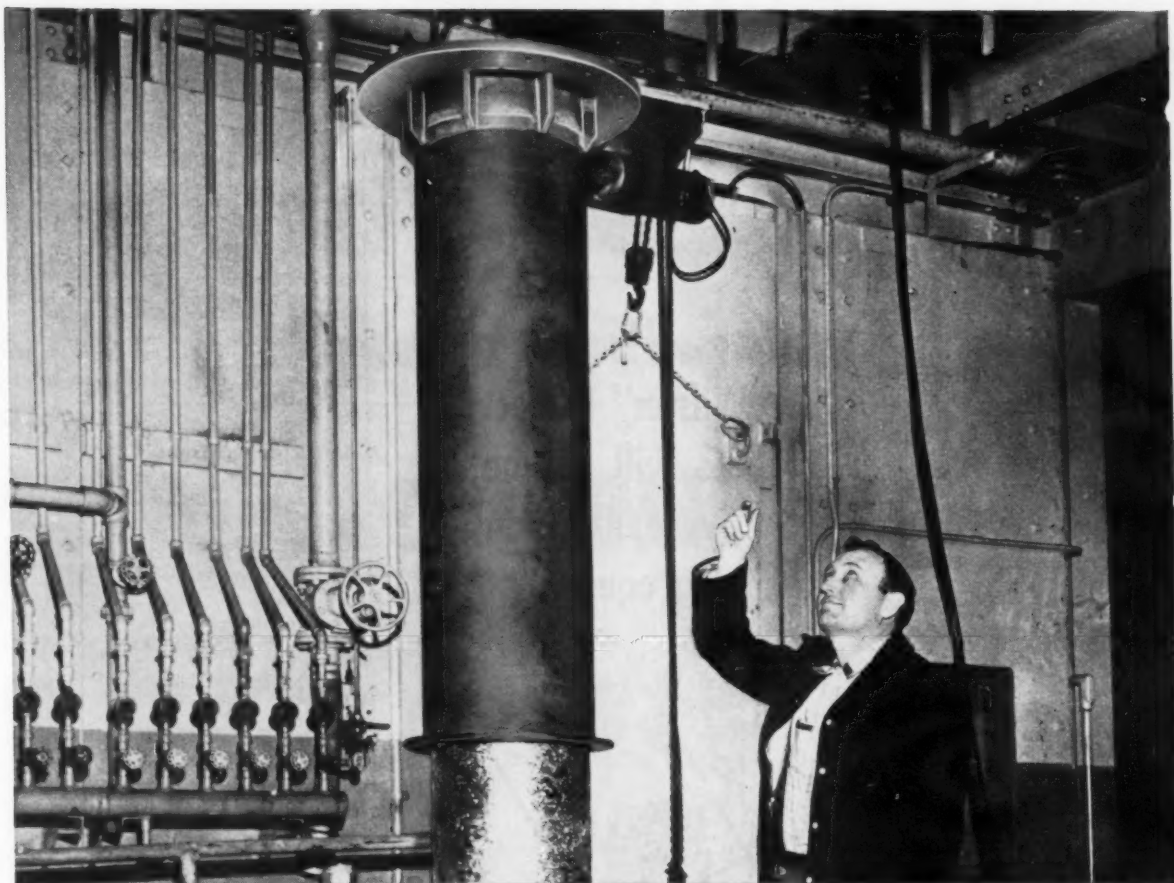
Bethlehem Steel Co., 701 East Third St., Bethlehem, Pa.  
New Departure Div., Bristol, Conn.  
Vanadium-Alloys Steel Co., Latrobe, Pa.  
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

**FORMING MACHINES, Cold-rolling**

Ferracute Machine Co., Bridgeton, N. J.  
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.  
Hartford Special Machinery Co., 287 Homestead Ave., Hartford, Conn.  
Hydraulic Press Mfg. Co., Mount Gilead, Ohio  
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.  
Niagara Mch. & Tool Works, 637 Northland Ave., Buffalo, N. Y.  
Yoder Co., 5500 Walworth, Cleveland, Ohio

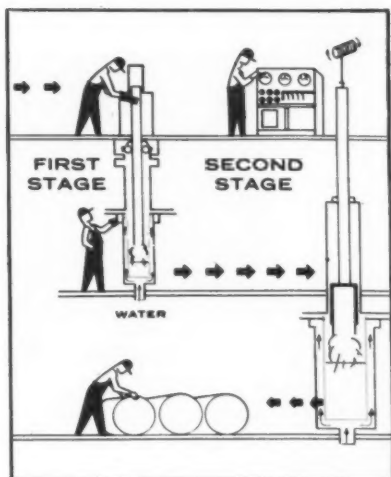
**FORMING MACHINES, Multiple-slide**

Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.  
Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio  
Bliss, E. W. Co., 1375 Raff Rd., S. W., Canton, Ohio  
Brown & Sharpe Mfg. Co., Providence, R. I.  
Chambersburg Engrg. Co., Chambersburg, Pa.  
Clearing Machine Corp., 6499 W. 65 St., Chicago 38, Ill.  
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.  
Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.  
Nilson, A. H. Machine Co., Bridgeport, Conn.  
U. S. Tool Co., Inc., 255 North Main St., Amherst, N. Y.



STRIPPING titanium ingot from crucible fabricated from Anaconda large-diameter seamless copper tube. During melting, the crucible is water cooled.

## How Copper helps make superior Titanium Ingots



SPONGE TITANIUM pressed into electrodes is melted in the first-stage arc furnace, forming ingots. Several such ingots are welded together and used as an electrode in the second melting. Double melting gives homogeneous, uniform ingots. A vacuum in the crucible assures low hydrogen content.

Titanium and titanium-alloy ingots that are homogeneous and have low carbon and hydrogen content are difficult to produce. Mallory-Sharon Titanium Corp. of Niles, Ohio, however, originated the double-melting process, "Method S," for production, which does the job.

A major factor in the successful production of ingots of sound structure is the use of water-cooled copper crucibles. Mallory-Sharon found that copper met the requirements for a satisfactory crucible material, particularly because of its high thermal conductivity.

Mallory-Sharon fabricates some of its crucibles more easily and quickly, using large-diameter Anaconda seamless copper tube for the body of the crucible. Various sizes are used for the crucibles—for example 20" I.D. x

½" wall thickness; and 15¼" I.D. x ¾" wall thickness. These big Anaconda tubes are now playing a key role in producing the ever-growing tonnage of the new structural metal so vital in the production of America's jet planes.

The American Brass Company produces the widest range of seamless tubes available to industry. At one end are tubes in copper and copper alloys up to 26" I.D. At the other are the capillary tubes as small as .032" O.D. and wall thickness of .005"—for instrument control, activating lines, and other precision purposes.

Whatever your tubing problem, see your American Brass Company representative. Or write: The American Brass Company, Waterbury 20, Conn.

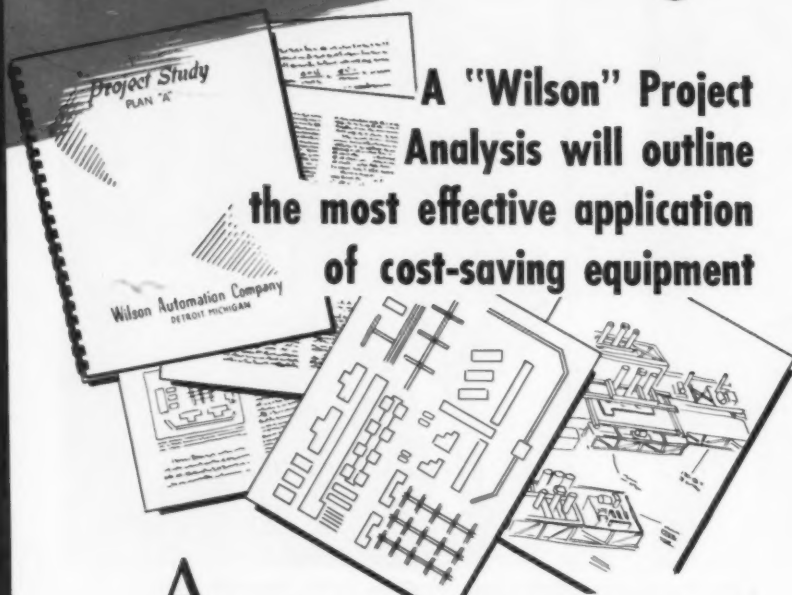
2764

# ANACONDA®

TUBES AND SHELLS in Copper, Everdur®, Cupro Nickel, Brass  
Made by The American Brass Company



# HOW CAN AUTOMATIC MATERIAL HANDLING REDUCE *Your* DIRECT COSTS



## A "Wilson" Project Analysis will outline the most effective application of cost-saving equipment

**A**utomation is often regarded only in terms of costly, complicated equipment. Properly defined and applied, automatic handling equipment can be a relatively simple, inexpensive means to reduce direct labor and move parts more conveniently.

A "Wilson" Project Analysis will outline the most effective application of cost-saving automatic handling for you—whether it be a single operation, a department, or an entire plant.

It is a complete recommendation tailored to your needs and normally includes detailed mechanical layouts, cost analysis, an estimate of total equipment investment, cost of plant rearrangement, expected amortization period, etc.

For more information, fill in and mail the reader service card bound into this issue. We will also reserve in your name an advance copy of "Automating for Profit," a fact-filled 24-page booklet telling "when to automate and where," now in preparation.



# WILSON AUTOMATION

27101 GROESBECK HIGHWAY at E. ELEVEN MILE • WRITE C/O P. O. BOX 3835, DETROIT 5, MICH.

Designers and builders of automatic equipment for handling, loading, conveying, assembling, storing, packaging, testing—for parts in process.

## F-G

### FORMING TOOLS or Tool Blanks

Brown & Sharpe Mfg. Co., Providence, R. I.  
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York  
Kennametal, Inc., Latrobe, Pa.  
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.  
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

### FURNITURE, Shop

Standard Pressed Steel Co., Jenkintown, Pa.

### GAGE BLOCKS

Brown & Sharpe Mfg. Co., Providence, R. I.  
Dearborn Gage Co., 22038 Beech St., Dearborn, Mich.  
DoALL Co., 254 N. Laurel Ave., Des Plaines, Ill.  
Pratt & Whitney Co., Inc., West Hartford, Conn.  
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

### GAGES, Air Comparator

Federal Products Corp., 1144 Eddy St., Providence 1, R. I.  
Pratt & Whitney Co., Inc., West Hartford, Conn.  
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.  
Sheffield Corp., Box 893, Dayton 1, Ohio  
Size Control Co., 2500 W. Washington Blvd., Chicago 12, Ill.

### GAGES, Automatic Sorting

Federal Products Corp., 1144 Eddy St., Providence 1, R. I.

### GAGES, DIAL, Bore, Height, Depth, Thread, Groove, etc.

Ames B. C., Co., Waltham 54, Mass.  
Brown & Sharpe Mfg. Co., Providence, R. I.  
Bryant Chucking Grinder Co., Clinton St., Springfield, Vt.  
Comtor Co., 47 Farwell St., Waltham 54, Mass.  
Dearborn Gage Co., 22038 Beech St., Dearborn, Mich.  
DoALL Co., Des Plaines, Ill.  
Federal Products Corp., 1144 Eddy St., Providence 1, R. I.  
Lufkin Rule Co., Saginaw, Mich.  
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.  
Size Control Co., 2500 W. Washington Blvd., Chicago 12, Ill.  
Starrett, The L. S., Co., Athol, Mass.

### GAGES Electric Comparator

Brown & Sharpe Mfg. Co., Providence, R. I.  
DoALL Co., Des Plaines, Ill.  
Federal Products Corp., 1144 Eddy St., Providence 1, R. I.  
General Electric Co., Schenectady, N. Y.  
Pratt & Whitney Co., Inc., West Hartford, Conn.  
Sheffield Corp., Box 893, Dayton 1, Ohio  
Size Control Co., 2500 W. Washington Blvd., Chicago 12, Ill.

### GAGES, Grinding

Federal Products Corp., 1144 Eddy St., Providence 1, R. I.

### GAGES, Machinists' Hand, including Center, Cutter Clearance, Drill Point, Drill Size, Planer, Radius, Screw Pitch, Taper, Telescoping Thickness

Brown & Sharpe Mfg. Co., Providence, R. I.

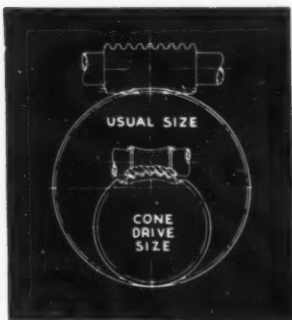
### GAGES, Multiple Inspection

Federal Products Corp., 1144 Eddy St., Providence 1, R. I.  
Pratt & Whitney Co., Inc., West Hartford, Conn.  
Sheffield Corp., Box 893, Dayton 1, Ohio

### GAGES, Plug and Ring

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Dearborn Gage Co., 22038 Beech St., Dearborn, Mich.  
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Metallurgical Products Dept. of General Elec-  
tric Co., Box 237, Roosevelt Park Annex,  
Detroit 32, Mich.  
Pratt & Whitney Co., Inc., West Hartford,  
Conn.  
Scherr, George Co., Inc., 200 Lafayette St.,  
New York 12, N. Y.  
Sheffield Corp., Box 893, Dayton 1, Ohio  
Size Control Co., 2500 W. Washington Blvd.,  
Chicago 12, Ill.  
Threadwell Tap & Die Co., 16 Arch St., Green-  
field, Mass.  
Van Keuren Co., Watertown, Mass.  
Winter Bros. Co., Rochester, Mich.

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Modern Industrial Eng. Co., 14230 Birwood  
Ave., Detroit 38, Mich.

#### GAGES, Roll Thread Snap, Adjustable Snap

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Greenfield Tap & Die Corp., Greenfield, Mass.  
Sheffield Corp., Box 893, Dayton 1, Ohio  
Size Control Co., 2500 W. Washington Blvd.,  
Chicago 12, Ill.  
Standard Gage Co., Inc., Poughkeepsie, N. Y.  
Threadwell Tap & Die Co., 16 Arch St., Green-  
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#### GAGES, Surface Roughness

DoAll Co., Des Plaines, Ill.  
Sheffield Corp., Box 893, Dayton 1, Ohio

#### GAGES, VERNIER, Height, Depth, Gear Tooth

Brown & Sharpe Mfg. Co., Providence, R. I.  
DoAll Co., Des Plaines, Ill.  
Federal Products Corp., 1144 Eddy St., Provi-  
dence 1, R. I.  
Starrett Co., L. S., Athol, Mass.

#### GASKETS

Garlock Packing Co., Palmyra, N. Y.

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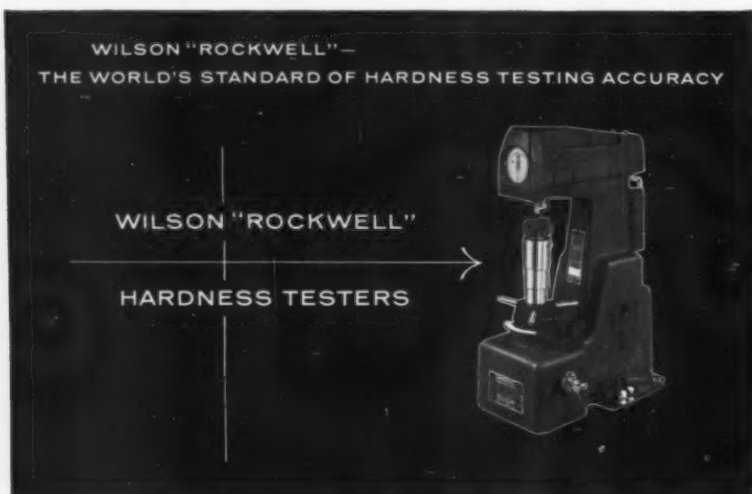
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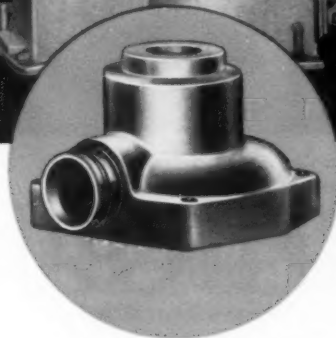
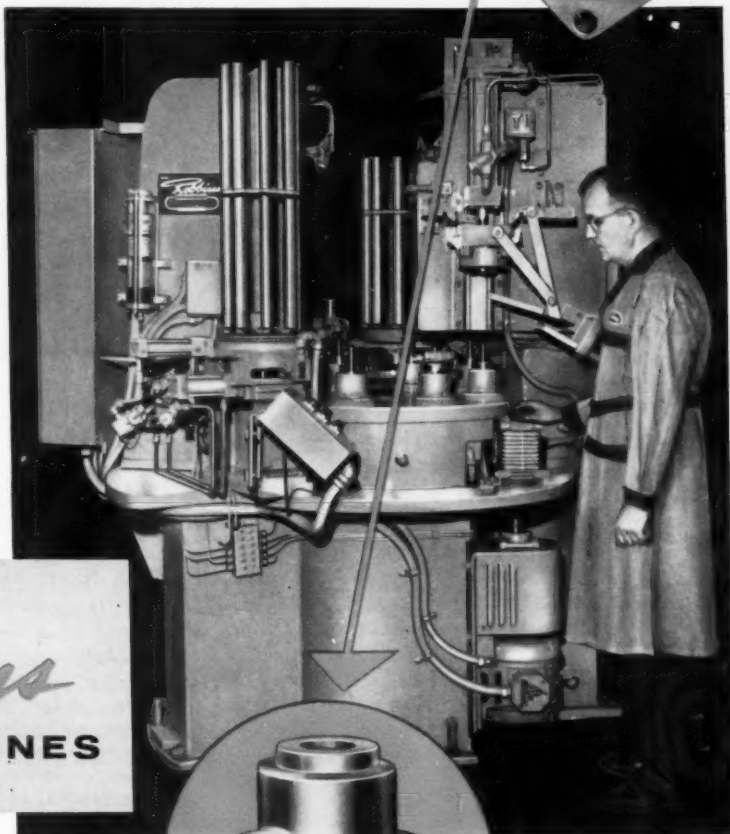
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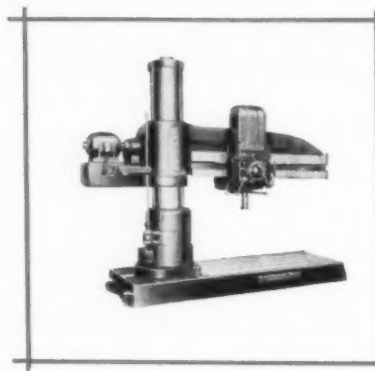


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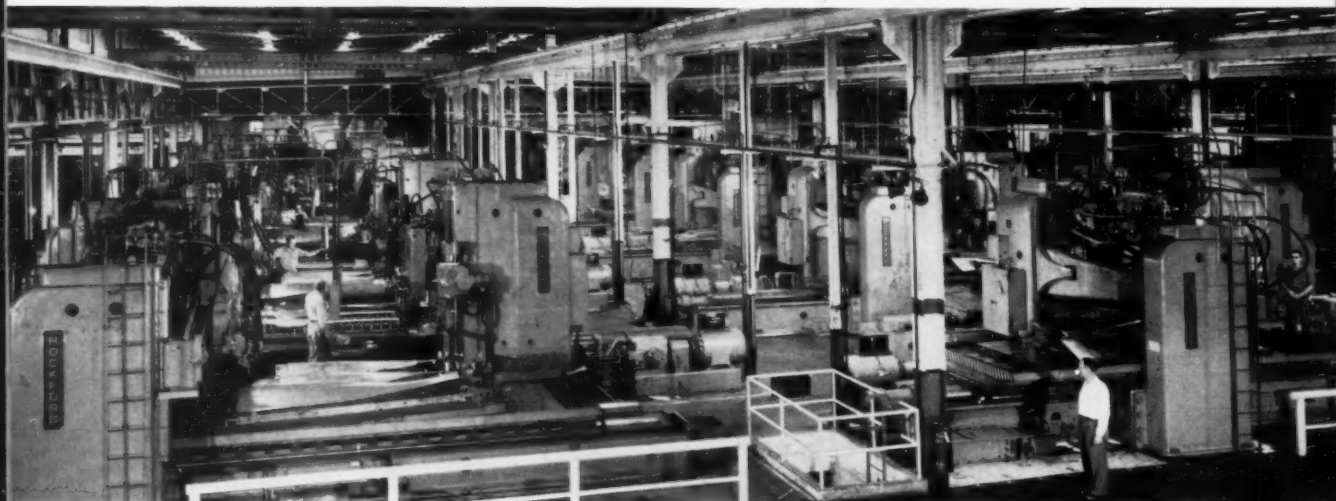
REPORT  
NO. 11,600  
AID TO  
MACHINE  
DESIGN  
PROGRESS

## From Oilgear Application-Engineering Files HOW OILGEAR ENGINEERING TEAMWORK AIDS MACHINE DESIGN PROGRESS

**CUSTOMER:** Rockford Machine Tool Company

**DATA:** Application of Fluid Power system to planers that mass-duplicate the airfoil on new, solid, forged steel propeller blades. Six years has been spent on the development and manufacturing methods to produce this new blade. Planers to be equipped with tracer attachments to machine blades from master templates.

Desired profile is completely machined to proper thickness . . . maintaining accurate airfoil on both sides of blade. Requirements: extreme accuracy; flexibility of control; elimination of shock, vibration and gear marks on work; independent, fast cutting and return speeds to keep costs to a minimum.



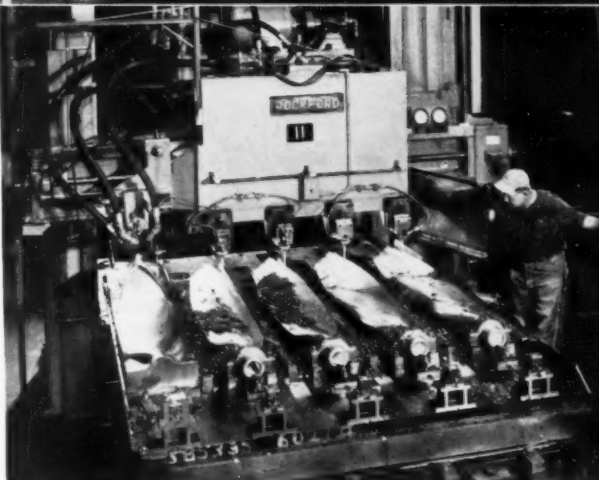
**SOLUTION:** Shown above are 20 Oilgear-equipped, Rockford Hy-Draulic planers machining aircraft propeller blades. Closeup (right) shows how Rockford's hydraulically operated "Kopy-Kats" can mass-duplicate four of these new-type, steel blades simultaneously from master templates. Rockford Machine Tool says of this set up, "The inherent advantages of hydraulic drive and control make this gigantic installation an extremely powerful production unit. Hydraulic drive is a natural for reciprocating machine tools. It's being proven daily in the world's finest machine shops." This is but *one* example of the ever increasing application of Oilgear-equipped machine tools. Rockford, and other designers and builders of tools for industry, have discovered that Oilgear *Application-Engineering* means cooperation and teamwork in supplying new production requirements . . . that Oilgear is more than just an "off-the-shelf" source of supply . . . that Oilgear is a Fluid Power design and engineering service based on over 35 years of pioneering and knowledge in precision, "Any-Speed" control, and efficient linear and rotary power systems. Because of this cooperative teamwork in solving problems—coupled with progressively engineered, trouble-free, dependable, Fluid Power control and drive systems—manufacturers have come to trust and depend upon Oilgear . . . the name that protects and enhances "OEM's" reputation, and assures satisfied users.

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Stahl Gear & Mch. Co., The, 3901 Hamilton Ave., Cleveland 4, Ohio

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Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio  
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U. S. Burke Machine Tool Div., Brotherton Rd., Cincinnati 27, Ohio

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Heald Machine Co., 10 New Bond St., Worcester 6, Mass.  
Le Maire Tool & Mfg. Co., Dearborn, Mich.  
Metallurgical Products Dept. of General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.  
Norton Co., 1 New Bond St., Worcester 6, Mass.  
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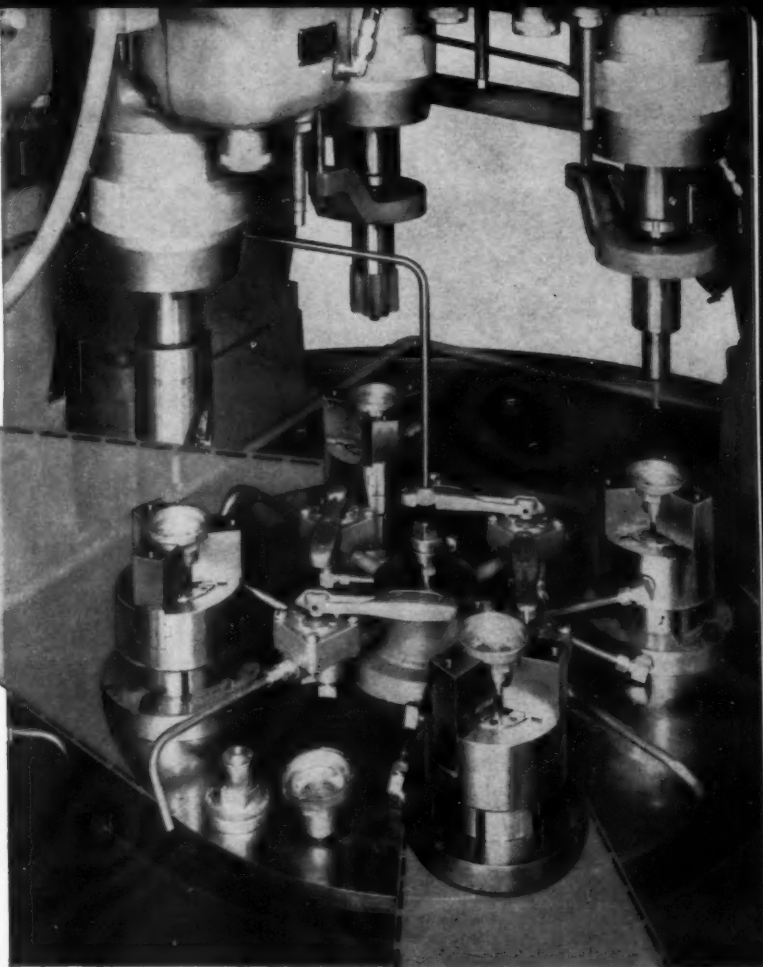
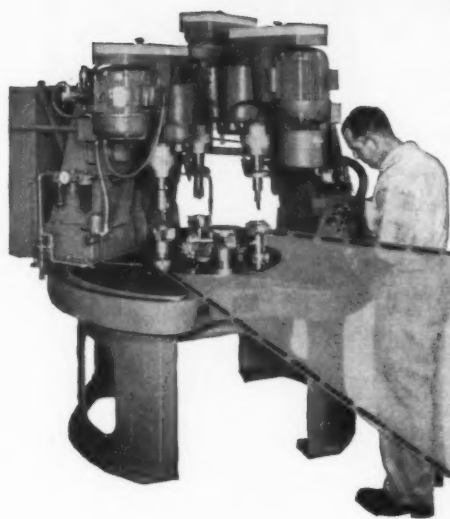
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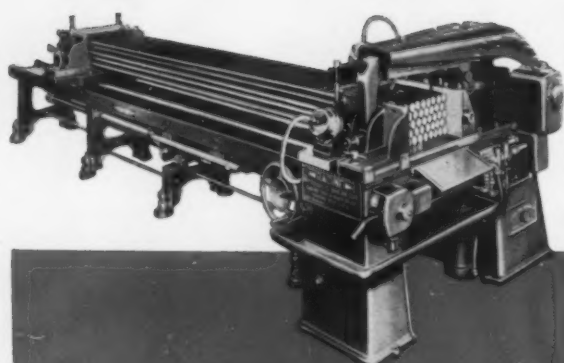


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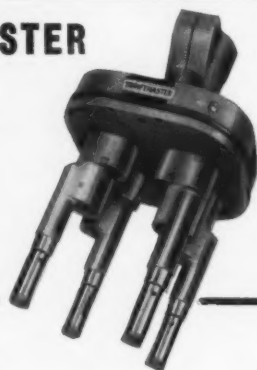
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Specifications

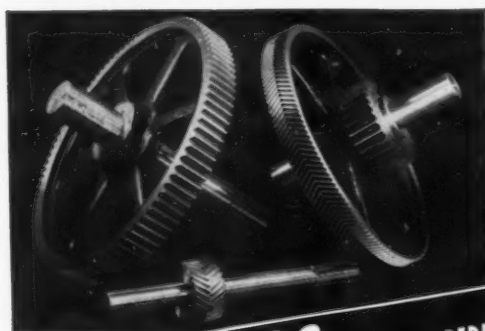
You and we can form a team—you to draw up the specifications; we to make the gears—that will be profitable to both of us. Gears of all types, all sizes, all materials. Design-engineering service available.

Custom Gears  
Exclusively

**DIEFENDORF GEAR  
CORPORATION**

Syracuse 1, N. Y.

# DIEFENDORF GEARS



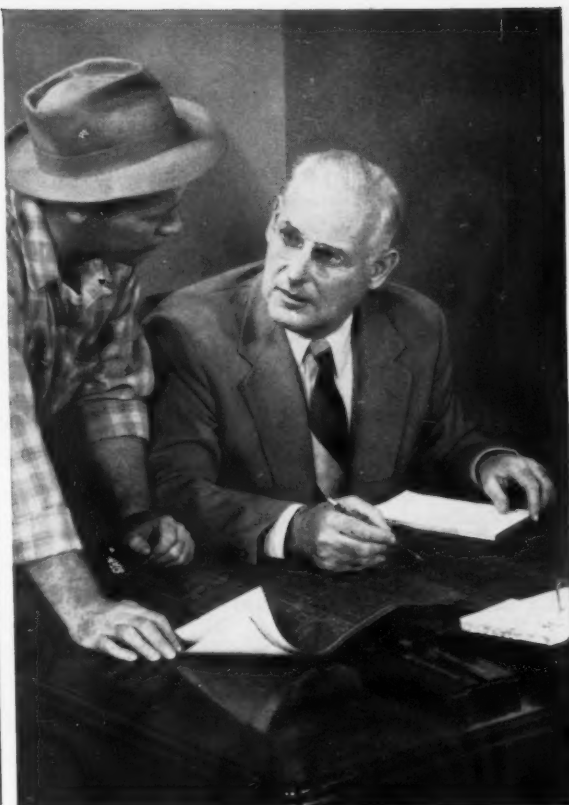
**GEARS** FOR SPEED REDUCERS

Illustrated are speed reducer assembly table gears for use in rolling mill machinery. Made right, of the finest materials, these gears give meaning to Stahl's long-standing reputation for producing gears to exact specification—economically and on time. Get Stahl's estimate first!

## Stahl

**GEAR & MACHINE COMPANY**  
3901 Hamilton Ave. Cleveland 14, Ohio

SPURS TO 72" PD, 1 DP  
BEVELS TO 54" PD, 1 DP  
SPIRAL, HELICAL and WORM GEARS  
TO 48" PD, 2 DP  
CONTINUOUS-TOOTH HERRINGBONE  
TO 60" PD, 2 DP  
SPROCKETS TO 72" PD, 2 1/2" CP  
RACKS TO 20 FT. LONG, 3 DP  
SILENT GEARS,  
RAWHIDE, BAKELITE, FIBROIL  
HEAT-TREATED, CASE OR FLAME  
HARDENED GEARS—  
OF CARBON OR ALLOY STEEL



rush it  
to **CDT**

Get those tough special design jobs off to Columbus Die-Tool for quick action. An outstanding engineering staff backed by 50 years of Company experience can make tough jobs look easy.

Whether it's special tools, jigs, fixtures or even special machinery, you'll find that CDT can build them better, faster and more economically. That's why so many of the nation's leading manufacturers regularly avail themselves of the specialized services of Columbus Die-Tool.

Perhaps we can solve your tooling problem and help you make your product... better, for less.

**Columbus Die-Tool  
AND MACHINE COMPANY**

P. O. BOX 750 • COLUMBUS, OHIO  
ESTABLISHED 1906

Designers and manufacturers of JIGS • FIXTURES • SPECIAL TOOLS •  
UNITS FOR MACHINE TOOLS • also Builders of Machine Tools Complete

**GRINDERS, Die and Mold**

Norton Co., 1 New Bond St., Worcester 6, Mass.  
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio

**GRINDERS, Drill Point**

Atlas Press Co., 20108 N. Pitcher, Kalamazoo, Mich.  
Consolidated Mch. Tool Div., 565 Blossom Rd., Rochester 10, N. Y.  
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.  
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.  
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.  
Standard Electrical Tool Co., 2500 River Rd., Cincinnati 4, Ohio

**GRINDERS, Face Mill**

Kearney & Trecker Corp., Milwaukee 14, Wis.  
Mattison Machine Works, 545 Blackhawk Park Ave., Rockford, Ill.  
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

**GRINDERS, Knife and Shear**

Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio  
Mattison Machine Works, Rockford, Ill.  
Mummert-Dixon Co., Hanover, Pa.  
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio

**GRINDERS, Portable Electric**

Chicago Pneumatic Tool Co., New York 17, N. Y.  
Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.  
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio  
Thor Power Tool Co., Prudential Plaza, Chicago 1, Ill.

**GRINDERS, Portable Pneumatic**

Chicago Pneumatic Tool Co., New York 17, N. Y.  
Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.  
Madison-Kipp Corp., Madison, Wis.  
Thor Power Tool Co., Prudential Plaza, Chicago 1, Ill.

**GRINDERS, Tap**

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.  
Rockford Die & Tool Wks., Inc., Rockford, Ill.

**GRINDERS, Tool and Cutter**

Atlas Press Co., 20108 N. Pitcher, Kalamazoo, Mich.  
Barber-Colman Co., Rock and Montague, Rockford, Ill.  
Brown & Sharpe Mfg. Co., Providence, R. I.  
Cincinnati Milling and Grinding Mchs., Cincinnati 9, Ohio  
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
Delta Power Tool Div., 400 Lexington Ave., Pittsburgh 8, Pa.  
Elox Corp. of Mich., Royal Oak 3, Mich.  
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.  
Gallmeyer & Livingston Co., 336 Straight Ave., S. W., Grand Rapids 4, Mich.  
Gleason Works, 1000 University Ave., Rochester 3, N. Y.  
Gorton, Geo., Mch. Co., 1321 Racine St., Racine, Wis.  
Homstrand, Inc., Larchmont, N. Y.  
Landis Tool Co., Waynesboro, Pa.  
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio  
Mummert-Dixon Co., Hanover, Pa.  
National Acme Co., 170 E. 131st St., Cleveland 8, Ohio  
Norton Co., 1 New Bond St., Worcester 6, Mass.  
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.  
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.  
South Bend Lathe Wks., South Bend 22, Ind.  
Thompson Grinder Co., 1500 W. Main St., Springfield, Ohio

**GRINDERS, Toolpost**

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.  
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio

**GRINDING GAGES—See Gages, Grinding****GRINDING MACHINES, Abrasive Belt**

Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.  
Hartford Special Machinery Co., 287 Homestead Ave., Hartford, Conn.  
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio  
Mattison Mch. Works, Rockford, Ill.  
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio  
Thor Power Tool Co., Prudential Plaza, Chicago 1, Ill.  
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

**GRINDING MACHINES, Broach**

Colonial Broach & Machine Co., P. O. Box 37, Harper St., Detroit 13, Mich.  
Gallmeyer & Livingston Co., 336 Straight, S. W., Grand Rapids 2, Mich.  
Lapointe Mch. Tool Co., 34 Tower St., Hudson, Mass.  
National Broach & Mch. Co., 5600 St. Jean, Detroit 13, Mich.  
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.  
Thompson Grinder, 1534 W. Main, Springfield, Ohio

**GRINDING MACHINES, Cam**

Landis Tool Co., Waynesboro, Pa.  
Norton Co., 1 New Bond St., Worcester 6, Mass.  
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.  
Van Norman Mch. Co., 3640 Main St., Springfield 7, Mass.

**GRINDING MACHINES, Centerless**

Bryant Chucking Grinder Co., Clinton St., Springfield, Vt.  
Cincinnati Milling and Grinding Mchs., Inc., Cincinnati 9, Ohio  
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.  
Landis Tool Co., Waynesboro, Pa.  
Triplex Machine Tool Corp., 75 West St., New York 6, N. Y.  
Van Norman Mch. Co., Springfield, Mass.

**GRINDING MACHINES, Crankshaft**

Landis Tool Co., Waynesboro, Pa.  
Norton Co., 1 New Bond St., Worcester 6, Mass.  
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.  
Van Norman Mch. Co., Springfield, Mass.

**GRINDING MACHINES, Cylindrical**

Aaron Machinery Co., Inc., 45 Crosby St., New York 12, N. Y.  
Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.  
Brown & Sharpe Mfg. Co., Providence, R. I.  
Cincinnati Milling and Grinding Mchs., Inc., Cincinnati 9, Ohio  
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
Frauenthal Div., Muskegon, Mich.  
Gallmeyer & Livingston Co., 336 Straight, S. W., Grand Rapids 2, Mich.  
Landis Tool Co., Inc., Waynesboro, Pa.  
Norton Co., 1 New Bond St., Worcester 6, Mass.  
Sheffield Corp., Box 893, Dayton 1, Ohio  
Standard Electrical Tool Co., 2500 River Rd., Cincinnati 4, Ohio  
Van Norman Co., 2640 Main St., Springfield 7, Mass.

**GRINDING MACHINES, Disc**

Brown & Sharpe Mfg. Co., Providence, R. I.  
Delta Power Tools Div., 400 Lexington Ave., Pittsburgh 8, Pa.  
Gardner Machine Co., Beloit, Wis.

Mattison Machine Works, Rockford, Ill.  
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.  
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio

**GRINDING MACHINES, Gear**

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
Gear Grinding Mch. Co., 3901 Christopher St., Detroit 11, Mich.  
Gleason Works, 1000 University Ave., Rochester 3, N. Y.  
Lees-Bradner Co., Cleveland, Ohio  
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.  
Russell, Holbrook & Henderson, Inc., 292 Madison Ave., New York 17, N. Y.  
Sheffield Corp., Box 893, Dayton 1, Ohio

**GRINDING MACHINES, Internal**

Aaron Machinery Co., Inc., 45 Crosby St., New York 1, N. Y.  
Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.  
Bryant Chucking Grinder Co., Clinton St., Springfield, Vt.  
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
Frauenthal Div., Muskegon, Mich.  
Gallmeyer & Livingston Co., 336 Straight, S. W., Grand Rapids 2, Mich.  
Hartford Special Machinery Co., 287 Homestead Ave., Hartford, Conn.  
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.  
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.  
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio  
Van Norman Mch. Co., Springfield, Mass.  
Wicaco Machine Corp., Wayne Junction, Philadelphia, Pa.

**GRINDING MACHINES, Jig**

Fosdick Mch. Tool Co., 1638 Blue Rock St., Cincinnati 23, Ohio  
Gallmeyer & Livingston Co., 336 Straight, S. W., Grand Rapids 2, Mich.  
Moore Special Tool Co., Inc., 740 Union Ave., Bridgeport, Conn.

**GRINDING MACHINES, Profile**

Baker Brothers, Inc., 1000 Post St., Toledo 10, Ohio  
Cincinnati Milling and Grinding Mchs., Inc., Cincinnati 9, Ohio  
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
Jones & Lamson Mch. Co., Springfield, Vt.  
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.  
Sheffield Corp., Box 893, Dayton 1, Ohio

**GRINDING MACHINES, Roll**

Landis Tool Co., Waynesboro, Pa.

**GRINDING MACHINES, Surface Reciprocating**

Aaron Machinery Co., Inc., 45 Crosby St., New York 12, N. Y.  
Brown & Sharpe Mfg. Co., Providence, R. I.  
Cincinnati Milling and Grinding Mchs., Inc., Cincinnati 9, Ohio  
Delta Power Tool Div., 400 Lexington Ave., Pittsburgh 8, Pa.  
DoAll Co., Des Plaines, Ill.  
Elox Corp. of Mich., Royal Oak 3, Mich.  
Foote-Burt Co., 13000 St. Clair Ave., Cleveland 8, Ohio  
Gallmeyer & Livingston Co., 336 Straight Ave., S. W., Grand Rapids 4, Mich.  
Gardner Machine Co., Beloit, Wis.  
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio  
Homstrand, Inc., Larchmont, N. Y.  
Mattison Machine Works, Rockford, Ill.  
Norton Co., 1 New Bond St., Worcester 6, Mass.  
Thompson Grinder Co., 1500 W. Main St., Springfield, Ohio  
Van Norman Mch. Co., Springfield, Mass.

**GRINDING MACHINES, Surface Rotary**

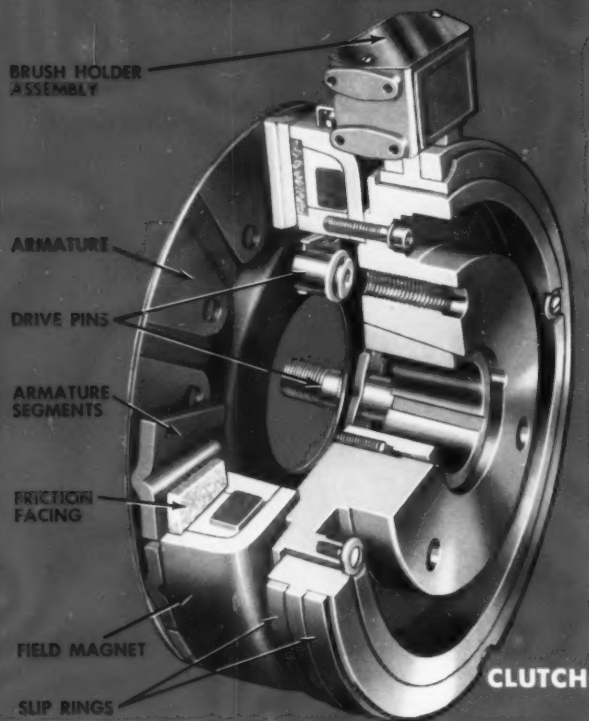
Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass. (Rotary)

(Continued on page 332)

# The New **EATON** **Dyna-TORQ**

**MAGNETIC-FRICTION CLUTCHES, BRAKES,  
CLUTCH-BRAKES, CLUTCH-COUPPLINGS**

**Are the Accurate, Trouble-Free Means of Controlling  
Power and Motion in Modern Stop-and-Go Machines**

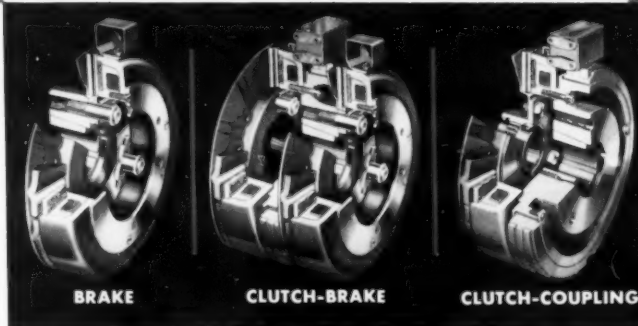


The Eaton Dyna-torQ electro-magnetic friction units include a number of unique design advancements which provide longer life and superior performance with less maintenance. Check the following important advantages:

- 1 Extremely Rapid Response in Clutching and Braking**—makes Dyna-torQ units ideally suited to a wide range of manual and automatic cycling applications.
- 2 Smooth, Shockless Engagement**—permits rapid operation without backlash or chatter.
- 3 Highly Effective Cooling**—maintains lower operating temperatures; permits fast, repetitive actuation.
- 4 Self-Adjustment**—automatically maintains proper clearance between armature shoes and field magnet.
- 5 Simple, Accurate Control**—manual or automatic; may be had to operate on 110, 220, or 440 volt, 60 cycle, alternating current.
- 6 Low Maintenance Costs**—result from unique design features and superior quality of construction, assuring long operating life and minimum down-time.

Eaton Dyna-torQ Clutches and Brakes are electrically operated, disc-type friction units having two basic components: a field magnet and an armature. Torque is transmitted as the magnet pulls the armature into engagement. Because the pull of the magnet is direct without intricate linkage, and the movement of the armature is slight, Dyna-torQ units are capable of extremely rapid response in clutching or braking.

Ask us to tell you how these Dyna-torQ units will fit your equipment.



**WIDE RANGE OF SIZES AND CAPACITIES**

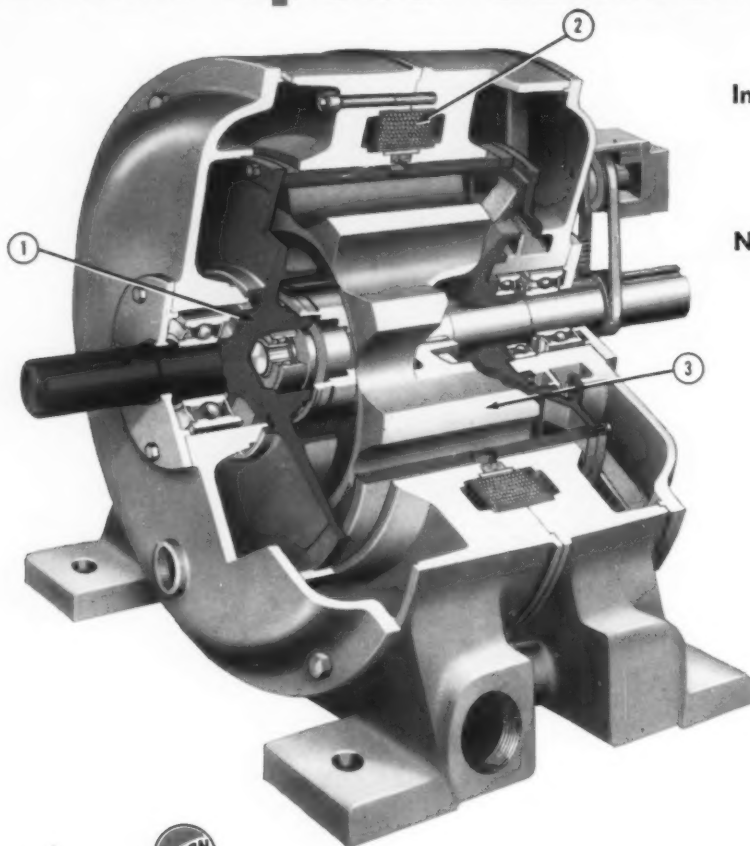
*Send for Illustrated Descriptive Literature*

# EATON

— **DYNAMATIC DIVISION** —  
**MANUFACTURING COMPANY**  
3307 FOURTEENTH AVENUE • KENOSHA, WISCONSIN



# Want Speed Control Like This?



Infinitely adjustable speed from AC power source

★

Wide speed range

★

No commutators, rings, brushes, or rotating coils

★

Instantaneous response

★

Remote control

★

Low power losses

★

Quiet, efficient operation

★

Simple construction

★

Low maintenance cost

1. Input Drum Assembly
2. Stationary Field Assembly
3. Output Rotor Assembly



## Eddy-Current Equipment is the Answer!

Dynamatic Eddy-Current Drives, Couplings and Brakes are the solution to difficult speed control problems—in both original equipment and factory installations. Smooth, stepless acceleration and deceleration are achieved without mechanical contact between rotating members. Eddy-current braking provides cushioned, controlled stops. Dynamatic electronic or magnetic amplifier controls, in conjunction with these units, assure wide latitude in operating functions. For efficient, economical speed control, investigate Dynamatic Eddy-Current Equipment.



Send for  
*Illustrated Literature Describing  
Dynamatic Eddy-Current Equipment*

# EATON

**DYNAMATIC DIVISION**  
**MANUFACTURING COMPANY**  
3307 FOURTEENTH AVENUE • KENOSHA, WISCONSIN



## This is the scrap pile for a run of 400 Class 5 tolerance screws

**Four minutes' worth of on-the-spot inspection on a Kodak Contour Projector tells operators how five critical tolerances of their work measure with company standards. Result—a reject rate of  $\frac{1}{4}$  of 1 per cent.**

The Chicago Screw Company, Division of Standard Screw Company, produces threads to Class 3, 4, and 5 tolerances—fine or better—for automotive, aircraft, and farm machinery makers.

Screws have tolerances of .005" lead error to fit a .002" dimensional tolerance gauge; .002" pitch diameter tolerance; and 15-minute tolerances on flank pitch.

Kodak Contour Projectors make it easy for operators to run rapid routine quality checks. Highly trained inspectors check operators' quality control reports and spot-check production.

When a tolerance question comes up, the accurate

answer again comes from a Kodak Contour Projector. In about four minutes, operators check out a thread completely, including pitch diameter, lead error, pitch, depth, and helix angle to tolerances well within .001". As a result, *the reject rate in the firm's threading division is down to an average of  $\frac{1}{4}$  of 1 per cent.*

A Kodak Contour Projector can be the way for you to keep tolerances profitably tight on mass production runs. It can also be the way for you to improve inspection accuracy and speed—while lowering your inspection costs. Send for the booklet "Projection Gaging with Kodak Contour Projectors."

Write to:



Kodak Contour Projector, Model 14-2A—a versatile, precision measuring projector for toolroom or production line.

**Apparatus and Optical Division  
EASTMAN KODAK COMPANY, Rochester 4, N. Y.**

### the KODAK CONTOUR PROJECTOR

**Kodak**  
TRADE MARK

Blanchard Machine Co., 64 State St., Cambridge, Mass.  
 Gardner Machine Co., Beloit, Wis.  
 Heald Machine Co., 10 New Bond St., Worcester 6, Mass.  
 Mattison Machine Works, Rockford, Ill.  
 National Acme Co., 170 E. 131st St., Cleveland 8, Ohio  
 Norton Co., 1 New Bond St., Worcester 6, Mass.  
 Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.  
 Thompson Grinder Co., 1500 W. Main St., Springfield, Ohio  
 Van Norman Mch. Co., Springfield, Mass.  
 Walker, O. S., Co., Inc., Worcester, Mass.

#### GRINDING MACHINES, Thread

Cosg Corp., 405 Lexington Ave., New York 17, N. Y.  
 Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
 Jones & Lamson Mch. Co., Springfield, Vt.  
 Landis Machine Co. (Centerless), Waynesboro, Pa.  
 Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.  
 Sheffield Corp., Box 893, Dayton 1, Ohio

#### GRINDING MACHINES, Universal

Aaron Machinery Co., Inc., 45 Crosby St., New York 12, N. Y.  
 Brown & Sharpe Mfg. Co., Providence, R. I.  
 Cincinnati Milling and Grinding Mchs., Inc., Cincinnati 9, Ohio  
 Cosg Corp., 405 Lexington Ave., New York 17, N. Y.  
 Frauenthal Div., Muskegon, Mich.  
 Gallmeyer & Livingston Co., 336 Straight, S.W., Grand Rapids 2, Mich.  
 Gorton Mch. Co., Geo., 1321 Racine St., Racine, Wis.  
 Jones & Lamson Mch. Co., Springfield, Vt.  
 Landis Tool Co., Waynesboro, Pa.  
 Norton Co., 1 New Bond St., Worcester 6, Mass.  
 Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.  
 Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.

Parker-Majestic, Inc., 147 Joseph Campau, Detroit, Mich.  
 Springfield Mch. Tool Co., 613 W. Southern Ave., Springfield, Ohio

#### GRINDING WHEEL DRESSING AND FORMING DEVICES

DoAll Co., Des Plaines, Ill.  
 Jones & Lamson Mch. Co., Springfield, Vt.  
 Metal Carbides Corp., Youngstown, Ohio  
 Moore Special Tool Co., Inc., 740 Union Ave., Bridgeport 7, Conn.  
 Norton Co., 1 New Bond St., Worcester 6, Mass.  
 Sheffield Corp., Box 893, Dayton 1, Ohio

#### GRINDING WHEELS

Blanchard Machine Co., 64 State St., Cambridge, Mass.  
 Cincinnati Milling and Grinding Mchs., Inc., Cincinnati 9, Ohio  
 Cincinnati Milling Products Div., Cincinnati 9, Ohio  
 Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.  
 DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.  
 Gardner Machine Co., Beloit, Wis.  
 Mackin Co., Jackson, Michigan  
 Metal Carbides Corp., Youngstown, Ohio  
 Norton Co., 1 New Bond St., Worcester 6, Mass.  
 Simonds Abrasive Co., Tacony and Fraley St., Bridgeburg, Philadelphia, Pa.

#### GROOVING TOOLS, Internal

Kennametal Inc., Latrobe, Penna.  
 Scully-Jones & Co., 1906 So. Rockwell St., Chicago 8, Ill.  
 Walde Kohinoor, Inc., 47-16 Austel Place, Long Island City 1, N. Y.  
 Wesson Co., 1220 Woodward Heights Blvd., Detroit 20, Mich.

#### HAMMERS, Drop—See Forging Hammers

#### HAMMERS, Portable Electric

Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.  
 Thor Power Tool Co., Prudential Plaza, Chicago 1, Ill.

#### HAMMERS, Portable Pneumatic

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.  
 Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.  
 Thor Power Tool Co., Prudential Plaza, Chicago 1, Ill.

#### HAMMERS, Power

Chambersburg Engrg. Co., Chambersburg, Pa.  
 Edlund Mchry. Co. Div., Cortland, N. Y.  
 Yoder Co., 5504 Walworth Ave., Cleveland 2, Ohio

#### HARDENING FURNACES

General Electric Co., Schenectady, N. Y.  
 Holcraft & Co., 6545 Epworth Blvd., Detroit 10, Mich.

#### HARDNESS TESTERS

Shore Instrument & Mfg. Co., 90-35C Van Wyck Exp., Jamaica 35, N. Y.  
 Wilson Mechanical Instrument Co., Inc., 230-D Park Ave., New York, N. Y.

#### HEAT-TREATING EQUIPMENT—See Annealing Furnaces, Flame Hardening Machines, Induction-heating Equipment

#### HOBS

Barber-Colman Co., Rock and Montague, Rockford, Ill.  
 Hanson-Whitney Co., 169 Bartholomew Ave., Hartford 3, Conn.  
 Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.  
 National Twist Drill & Tool Co., Rochester, Mich.  
 Russell, Holbrook & Henderson, Inc., 292 Madison Ave., New York 17, N. Y.  
 Star Cutter Co., 34500 Grand River, Farmington, Mich.

#### HOISTS, Air

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.  
 Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.  
 Thor Power Tool Co., Prudential Plaza, Chicago 1, Ill.

#### HOISTS, Electric

Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.

#### HONING MACHINES

Barnes Drill Co., 814 Chestnut, Rockford, Ill.  
 Micromatic Hone Corp., 8100 Schoolcraft, Detroit 4, Mich.  
 Moline Tool Co., 102-20th St., Moline, Ill.  
 Van Norman Mch. Co., 3640 Main St., Springfield 7, Mass.

#### HONING STONES

Barnes Drill Co., 814 Chestnut St., Rockford, Ill.  
 Norton Co., 1 New Bond St., Worcester 6, Mass.

#### HOSE

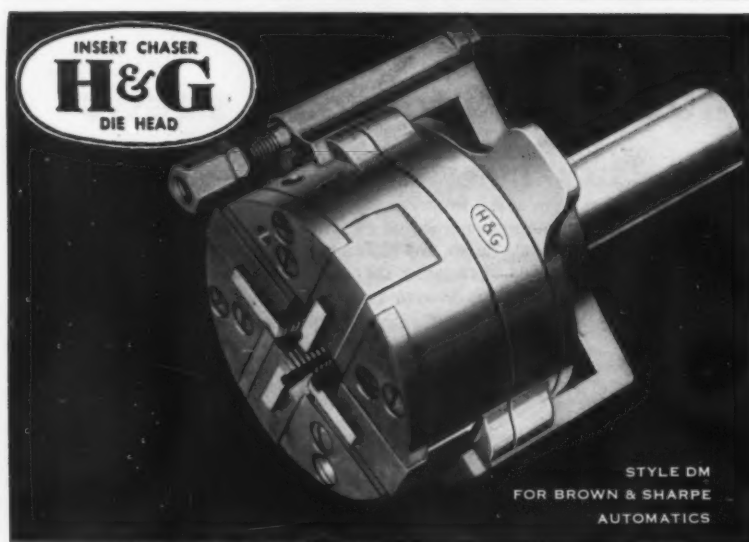
American Metal Hose Br. American Brass Co., 25 Broadway, New York, N. Y.  
 Schrader's Son, A., 470 Vanderbilt Ave., Brooklyn 38, N. Y.

#### HYDRAULIC MACHINERY

##### Tools and equipment

Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.  
 Barnes Drill Co., 814 Chestnut St., Rockford, Ill.  
 Bethlehem Steel Corp., Bethlehem, Pa.  
 Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.

(Continued on page 334)



STYLE AND SIZES FOR ALL MACHINES ON WHICH THREADS ARE CUT

## On Brown and Sharpe, and other automatics

### INSERT CHASERS SAVE UP TO 33%

Insert chasers are like safety razor blades: they cost so little that you can throw them away when dull. Or, for utmost economy, you can resharpen them over and over again. Only a flash grind is required. For less than \$45 you get a dozen sets of  $\frac{1}{8}$ -16 insert chasers, each set ground ready to go. You will be amazed at the quantity of threads they will cut, even to Class 3 specifications, with a minimum of downtime. FREE: "Unified and American Screw Thread Digest".

THE EASTERN MACHINE SCREW CORPORATION 23-43 Barclay St., New Haven, Conn.

**O. S. Walker offers  
a complete new line  
of permanent magnetic chucks!**



Now, from O. S. Walker, the originator of magnetic chucks, comes a completely new, full line of chucks, with the most permanent magnets ever produced! They're ceramic\*, with many times the coercive force of alloy magnets. The face is *all steel*, with no soft insulating material. These chucks offer many important advantages:—

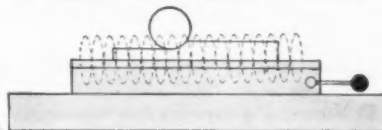
- Weight is 50% less than conventional permanent chucks; minimizes reciprocating table inertia.
- Their low, low height gives greater-than-ever machine capacity.
- Fine pole divisions give maximum holding power.
- All magnetic fields are controlled to prevent magnetization of machine table or ways.

Write for details.

\*Patent applied for.

**... perfect  
for milling, too!**

These new chucks are perfect for milling or planing due to their exclusive construction.† Cutter is constantly *demagnetized* as it progresses, with *no fouling of cutter and work with chips!*



†O. S. Walker magnets are polarized *horizontally!*

**O. S. WALKER** COMPANY, INC.  
WORCESTER 6, MASSACHUSETTS

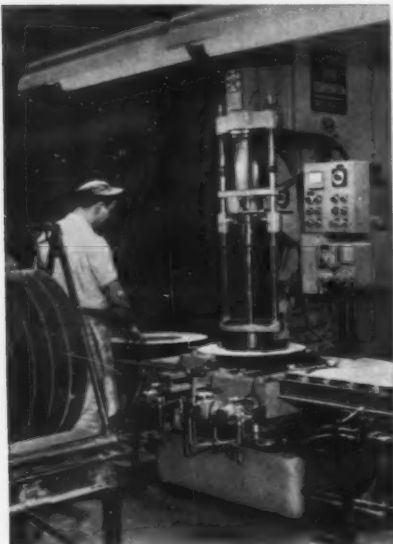
*Permanent magnetic and electro-magnetic rotary and rectangular chucks,  
demagnetizers, lifting magnets, vacuum chucks.*



# Why MICROHONING

## Lowers Costs, Increases Production, Improves Quality of Grinding Wheels

Bay State Abrasive Products Company, one of the largest and most progressive manufacturers of abrasive products, Microhones the arbor hole of their snagging wheels to secure improved wheel performance, reduce manual handling, lower processing costs and increase production.



### Why Microhoning Saves Time, Energy and Reduces Processing Costs of Arbor Holes over 50%:

1. **Less Equipment**—one Microhoning machine does work of two grinders.
2. **Less Operating Costs**—Microhoning processes 450 to 600 grinding wheels per set of abrasive sticks; abrasives cost was substantially higher with former grinding method.
3. **Less Maintenance**—Hydrohoner has no chucks to maintain and there is now only one machine instead of two.
4. **Less Gaging**—Microhoning automatically brings arbor hole to size within .003" tolerance; former grinding method required repeated gaging during operation.

### Why Microhoning Improves Performance of Grinding Wheels:

1. **Better Fit**—inherent qualities of the Microhoning process are geometric accuracy and ability to hold close tolerances . . . rounder and accurately sized arbor holes assure a better fit.
2. **Less Arbor Wear**—Microhoning cuts both abrasive grain and resinoid bond while producing a smoother hole.
3. **Less Chatter**—Microhoning assures arbor holes that are square with faces and more concentric with O.D.

See page to right for "How Microhoning" accomplishes the above results.

The principles and application of Microhoning are explained in a 30-minute, 16mm, sound movie, "Progress in Precision" . . . available at your request.

- ☐ Please send me "Progress in Precision" in time for showing on \_\_\_\_\_ (date).
- ☐ Please have a Micromatic Field Engineer call.
- ☐ Please send Microhoning literature and case histories.

NAME \_\_\_\_\_

TITLE \_\_\_\_\_

COMPANY \_\_\_\_\_

STREET \_\_\_\_\_

CITY \_\_\_\_\_

ZONE \_\_\_\_\_

STATE \_\_\_\_\_



# MICROMATIC HONE CORP.

8100 SCHOOLCRAFT AVENUE • DETROIT 38, MICHIGAN

Bilas, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio  
 Chambersburg Engrg. Co., Chambersburg, Pa.  
 Colonial Broach & Machine Co., P.O. Box 37, Harper Sta., Detroit 13, Mich.  
 Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.  
 Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio  
 Elmes Eng. Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio  
 Erie Foundry Co., Erie, Pa.  
 Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.  
 Hanson-Whitney Co., 169 Bartholomew Ave., Hartford 3, Conn.  
 Hydraulic Press Mfg. Co., Mount Gilead, Ohio  
 Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.  
 Michigan Drill Head Co., Detroit 34, Mich.  
 Modern Ind. Engrg. Co., 14230 Birchwood Ave., Detroit 4, Mich.  
 Motch & Merryweather Machinery Co., Penton Bldg., Cleveland, Ohio  
 Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.  
 Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.  
 Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.  
 Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.  
 Versor Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.  
 Vickers Incorporated, Div. of Sperry Rand Corp., 1402 Oakman Blvd., Detroit, Mich.  
 Watson-Stilman Co., Roselle, N. J.  
 Wilson, K. R., Inc., 211 Mill St., Arcade, N. Y.

### HYDRAULIC POWER UNITS OR TOOL HEADS

Barnes Drill Co., 814 Chestnut, Rockford 3, Ill.  
 Barnes, W. F. & John Co., 201 S. Waterford St., Rockford, Ill.  
 Elmes Eng. Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio  
 Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
 Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.  
 Hartford Special Machinery Co., 287 Homestead Ave., Hartford 12, Conn.  
 Hydraulic Press Mfg. Co., Mount Gilead, Ohio  
 Le Maire Tool & Mfg. Co., Dearborn, Mich.  
 Michigan Drill Head Co., Detroit 34, Mich.  
 Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.  
 Vickers Incorporated, Div. of Sperry Rand Corporation, 1402 Oakman Blvd., Detroit, Mich.

### INDEXING and SPACING EQUIPMENT

Austin Industrial Corp., White Plains, N. Y.  
 Brown & Sharpe Mfg. Co., Providence, R. I.  
 Eisler Engrg. Co., Inc., 750 South 13th St., Newark, N. J.  
 Ettco Tool Co., Inc., 594 Johnson Ave., Brooklyn 37, N. Y.  
 Hardinge Bros., Inc., 1420 College Ave., Elmira, N. Y.  
 Hartford Special Machinery Co., 287 Homestead Ave., Hartford, Conn.  
 Kearney & Trecker Corp., 6784 W. National, Milwaukee 14, Wis.  
 Morris, Robert E. Co., W. Hartford, Conn.  
 Opto-Metric Tools, Inc., 137 Varick St., New York, N. Y.  
 Robbins, Omer E. Co., 24800 Plymouth Rd., Detroit 39, Mich.  
 Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.  
 Van Norman Mch., 3640 Main St., Springfield 7, Mass.  
 Wadell Equip. Co., Clark, N. J.  
 Western Machine Tool Works, Holland, Mich.

### INDICATOR BASES, Magnetic

Brown & Sharpe Mfg. Co., 235 Promenade St., Providence 1, R. I.  
 DoAll Co., Des Plaines, Ill.  
 Starrett, L. S., Co., Athol, Mass.

### INDICATOR LIGHTS—See Lights, Indicator

### INDICATORS, Dial

Ames, B. C., Waltham 54, Mass.  
 Brown & Sharpe Mfg. Co., Providence, R. I.  
 DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.  
 Federal Products Corp., P. O. Box 1027, Providence, R. I.  
 Lufkin Rule Co., Saginaw, Mich.  
 National Automatic Tool Co., S. 7th-N Sts., Richmond, Ind.  
 Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.  
 Starrett, The L. S. Co., Athol, Mass.

**INDICATORS, Speed**

Brown & Sharpe Mfg. Co., Providence, R. I.  
General Electric Co., Schenectady, N. Y.  
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.  
Reliance Elec. & Engrg. Co., 1200 Ivanhoe Rd., Cleveland 10, Ohio  
Starrett, The L. S. Co., Athol, Mass.

**INDICATORS, Test**

Brown & Sharpe Mfg. Co., Providence, R. I.  
Federal Products Corp., P. O. Box 1027, Providence, R. I.  
National Automatic Tool Co., S. 7th & N Sts., Richmond, Ind.  
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.  
Starrett, The L. S. Co., Athol, Mass.

**INDUCTION HEATING EQUIPMENT**

Cincinnati Milling & Grinding Mchcs., Inc., 4701 Marburg Ave., Cincinnati 9, Ohio  
General Electric Co., Schenectady, N. Y.  
Lepel High Frequency Laboratories, Inc., Woodside 77, N. Y.  
Ohio Crankshaft Co., 3800 Harvard Ave., Cleveland, Ohio  
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.

**INSPECTION EQUIPMENT, Ultrasonic**

Curtiss-Wright Corp., Caldwell, N. J.

**INTENSIFIERS, Hydraulic**

Hydraulic Press Mfg. Co., Mount Gilead, Ohio  
Logansport Mch. Co., Inc., Logansport, Ind.  
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.  
Watson-Stillman Co., Roselle, N. J.

**JACKS, Planer—See Set-up Equipment****JIG BORERS**

Aaron Machinery Co., Inc., 45 Crosby St., New York 12, N. Y.  
American Sip Corp., 100 E. 42nd St., New York 17, N. Y.  
Cleerman Machine Tool Co., Green Bay, Wis.  
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio  
Homestrand, Inc., Larchmont, N. Y.  
M. B. I. Export & Import, Ltd., 475 Grand Concourse, New York 51, N. Y.  
Moore Special Tool Co., Inc., 724 Union Ave., Bridgeport, Conn.  
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.  
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

**JIGS AND FIXTURES**

Bath, Cyril Co., Aurora & Solon Road, Solon, Ohio  
Columbus Die Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio  
Hartford Special Mchry. Co., 287 Homestead Ave., Hartford, Conn.  
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.  
La Salle Tool, Inc., 3840 E. Outer Drive, Detroit 34, Mich.  
Metal Carbides Corp., Youngstown 12, Ohio  
Modern Industrial Engrg. Co., 14230 Birwood Ave., Detroit 28, Mich.  
Portage Mch. Co., 1025 Sweitzer Ave., Akron 11, Ohio  
Robbins, Omer E. Co., 24800 Plymouth Rd., Detroit 39, Mich.  
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio

**KEYSEATERS**

Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio  
Bliss, E. W. Co., Canton, Ohio  
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
Davis Keyseater Co., 405 Exchange St., Rochester 8, N. Y.  
Heller Tool Co., Heller Dr., Newcomerstown, Ohio  
Mitts & Merrill, 1809 S. Water St., Saginaw, Mich.

**KNURLING TOOLS**

Armstrong Bros. Tool Co., 5213 W. Armstrong Ave., Chicago 30, Ill.  
Pratt & Whitney Co., Inc., West Hartford, Conn.  
Read Rolled Thread Die Co., P. O. Box 350, Worcester 1, Mass.  
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

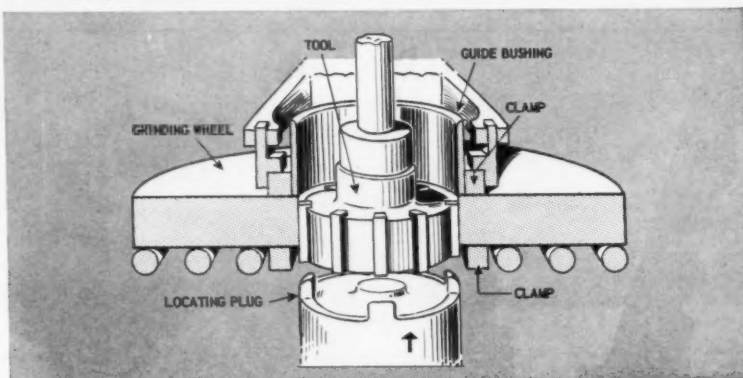
**LAPPING MACHINES**

Cincinnati Milling & Grinding Mchcs., Inc., 4701 Marburg Ave., Cincinnati 9, Ohio  
(Continued on page 336)

# How MICROHONING

## Lowers Costs, Increases Production, Improves Quality of Grinding Wheels

By changing from grinding to Microhoning of arbor holes, Bay State Abrasive Products Company has realized substantially lower processing costs, raised productivity and improved the performance qualities of their snagging wheels.



### Here's How Microhoning Now Saves Time, Labor, Material and Processing Costs:

1. Snagging wheels now travel from facing machine to Hydrohoner on a conveyor—there is no manual lifting or handling.
2. A disappearing plug automatically locates wheels in Hydrohoner where they are clamped on the faces and remain stationary during Microhoning operation—there is no manual placing of wheels on chucks, or chucks to maintain.
3. One Hydrohoner does work of two grinders; and one set of Bay State iron bonded, diamond sticks Microhones from 450 to 600 resinoid-bonded wheels—less equipment to maintain and lower costs for abrasive.
4. In approximately a minute, Microhoning removes from .030" to .070" of stock from arbor holes ranging in diameter from 6" to 12"—processing is faster and material is saved because wheels can now be molded closer to final size.
5. Microhoning tool automatically holds diametric accuracy within .003" tolerance—repeated manual gaging is eliminated.

See page to left for "Why Microhoning" provides cost-and-time-saving benefits.

Send Coupon for Complete Information

Learn how Microhoning will give efficient stock removal, closer tolerances, accurate alignment and functional surfaces.

- ☐ Please have a Micromatic Field Engineer call.  
☐ Please send Micromatic literature and case histories.



NAME \_\_\_\_\_ H  
TITLE \_\_\_\_\_  
COMPANY \_\_\_\_\_  
STREET \_\_\_\_\_  
CITY \_\_\_\_\_ ZONE \_\_\_\_\_ STATE \_\_\_\_\_

# MICROMATIC HONE CORP.

8100 SCHOOLCRAFT AVENUE • DETROIT 38, MICHIGAN

## Product Directory

Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill. (Lapmaster Div.)  
DoAll Co., Des Plaines, Ill.  
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
Gleason Works, 1000 University Ave., Rochester, N. Y.  
Micromatic Hone Corp., 8100 Schoolcraft, Detroit 4, Mich.  
Norton Co., 1 New Bond St., Worcester 6, Mass.  
Size Control Co., Div. of American Gage & Mch. Co., 2500 W. Washington Blvd., Chicago 12, Ill.

### LATHE ATTACHMENTS

Atlas Press Co., Kalamazoo, Mich.  
Axelson Mfg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Calif.  
Delta Power Tool Div., Rockwell Mfg. Co., Pittsburgh, Pa.  
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.  
Hardinge Bros., Inc., 1420 College Ave., Elmira, N. Y.

Jones & Lamson Mch., 512 Clinton St., Springfield, Vt.  
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio  
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio  
Sheldon Mch. Co., Inc., 4258 N. Knox Ave., Chicago 41, Ill.  
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.  
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

### LATHES, AUTOMATIC—See Chucking Machines

### LATHES, Axle

Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio  
Consolidated Mch. Tool Div., Farrel-Birmingham Co., Inc., Rochester 10, N. Y.  
Monarch Mch. Tool Co., Oak St., Sidney, Ohio

Morey Machinery Co., 383 Lafayette St., New York 3, N. Y.  
Seneca Falls Mch. Co., Seneca Falls, N. Y.  
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

### LATHES, Bench

Aaron Machinery Co., Inc., 45 Crosby St., New York 12, N. Y.  
Atlas Press Co., Kalamazoo, Mich.  
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
Hardinge Bros., Inc., 1420 College Ave., Elmira, N. Y.  
Homestrand, Inc., Larchmont, N. Y.  
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio  
Levin, Louis & Son, Los Angeles 21, Calif.  
Sheldon Mch. Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.  
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

### LATHES, Car Wheel

Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio  
Bullard Co., Bridgeport 6, Conn.  
Consolidated Mch. Tool Div., Blossom Road, Rochester 10, N. Y.

### LATHES, Copying, Duplicating

Pilot Div., Cone Automatic Mch. Co., 30 Rockefeller Plaza, New York, N. Y.  
Seewald Inc., 1956 Woodbridge Ave., New Brunswick, N. J.

### LATHES, Crankshaft

Consolidated Mch. Tool Corp., Rochester, N. Y.  
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio  
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.  
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

### LATHES, Double-End

Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio  
Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio  
Consolidated Mch. Tool Corp., Rochester, N. Y.  
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio  
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.  
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

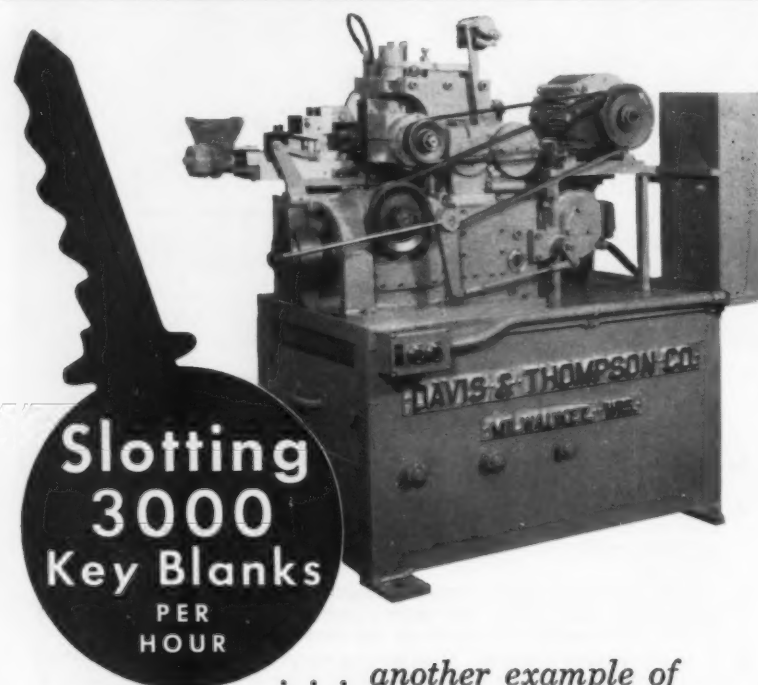
### LATHES, Duplicating

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Calif.  
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio  
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio  
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio  
Sidney Machine Tool Co., Sidney, Ohio

### LATHES, Engine, Manufacturing

Aaron Machinery Co., Inc., 45 Crosby St., New York 12, N. Y.  
American Tool Works Co., Pearl and Eggleston Aves., Cincinnati, Ohio  
Atlas Press Co., Kalamazoo, Mich.  
Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Calif.  
Barber-Colman Co. (Hendey Mch. Div.), Rockford, Ill.  
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati 9, Ohio  
Consolidated Mch. Tool Div., Blossom Road, Rochester 10, N. Y.  
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
Delta Power Tool Div., Rockwell Mfg. Co., Pittsburgh, Pa.  
Eustacchio, S., Brescia, Italy  
Homestrand, Inc., Larchmont, N. Y.  
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio  
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio

(Continued on page 338)



**Slotting  
3000  
Key Blanks  
PER  
HOUR**

*... another example of  
Davis & Thompson Production Engineering*

If you need high production in milling, drilling, boring and similar metalworking operations ... with a minimum of equipment and capital expenditure, call in a Davis and Thompson Representative.

This key blank slotting machine is only one of countless machining problems solved by D & T Engineers.

Space does not permit describing this machine in full detail, but if you would like complete details, write.



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# CLEEREMAN

## DRILLING MACHINES

A battery of box column and round column Cleereman Drilling Machines on production work. One of many such installations producing at lower costs with higher production, less operator fatigue and no down time.



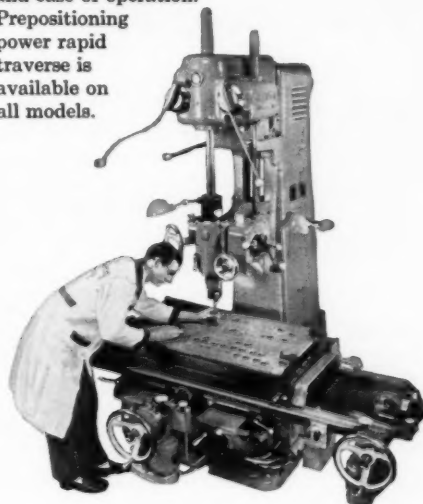
## LAYOUT DRILLING MACHINE

A modern solution to an old problem. Built for those tool room and manufacturing jobs which do not require the ultra precision of Cleereman Jig Borers. The Cleereman Layout Machine is an economical machine capable of locating within .001" per foot and drilling, boring, reaming, tapping, etc., with utmost operator ease at a fast rate of production.

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Unexcelled precision for ultra-fine tolerances on highest quality gage, tool, die, jig and fixture work and on "jigless" production. Combines stamina with precision and ease of operation. Prepositioning power rapid traverse is available on all models.



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Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio  
 Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.  
 Seewald Inc., 1956 Woodbridge Ave., New Brunswick, N. J.  
 Sheldon Mch. Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.  
 Sidney Machine Tool Co., Sidney, Ohio  
 South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.  
 Springfield Mch. Tool Co., Springfield, Ohio  
 Western Machine Tool Works, Holland, Mich.  
 Wickes Brothers, 512 No. Water St., Saginaw, Mich.

### LATHES, Engine, Toolroom

Aaron Machinery Co., Inc., 45 Crosby St., New York 12, N. Y.  
 American Tool Works Co., Pearl and Eggleston Aves., Cincinnati, Ohio  
 Atlas Press Co., Kalamazoo, Mich.  
 Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Calif.  
 Barber-Colman Co. (Hendey Mch. Div.), Rockford, Ill.  
 Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati 9, Ohio  
 Cosg Corp., 405 Lexington Ave., New York 17, N. Y.  
 Hardinge Bros. Inc., 1420 College Ave., Elmira, N. Y.  
 Homestrand, Inc., Larchmont, N. Y.  
 LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio  
 Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio  
 Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio  
 Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.  
 Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.  
 Sheldon Mch. Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.  
 Sidney Machine Tool Co., Sidney, Ohio  
 South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.  
 Springfield Mch. Tool Co., Springfield, Ohio  
 Western Machine Tool Works, Holland, Mich.

### LATHES, Gap

Aaron Machinery Co., Inc., 45 Crosby St., New York 12, N. Y.  
 Atlas Press Co., Kalamazoo, Mich.  
 Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Calif.  
 Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati 9, Ohio  
 Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.  
 Homestrand, Inc., Larchmont, N. Y.  
 LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio  
 Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio  
 Sidney Machine Tool Co., Sidney, Ohio  
 Springfield Mch. Tool Co., Springfield, Ohio

### LATHES, Hollow Spindle

Axelson Mfg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Calif.  
 Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio  
 LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio  
 Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio  
 South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

### LATHES, Roll

American Tool Works Co., Pearl and Eggleston Aves., Cincinnati 2, Ohio  
 Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio  
 Bliss, E. W., Co., Canton, Ohio  
 LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio  
 Monarch Mch. Tool Co., Oak St., Sidney, Ohio

### LATHES, Speed, Second-operation

Atlas Press Co., Kalamazoo, Mich.  
 Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.  
 Hardinge Bros., Inc., 1420 College Ave., Elmira, N. Y.  
 LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio

Lodge & Shipley Co., Cincinnati 25, Ohio  
 Monarch Mch. Tool Co., Oak St., Sidney, Ohio  
 Seneca Falls Mch. Co., Seneca Falls, N. Y.  
 Sheldon Mch. Co., 4258 N. Knox Ave., Chicago 41, Ill.  
 Standard Electrical Tool Co., 2500 River Rd., Cincinnati 4 Ohio

### LATHES, Spinning

Cincinnati Milling & Grinding Mch., Inc., 4701 Marburg Ave., Cincinnati 9, Ohio  
 Lodge & Shipley Co., The, Cincinnati 25, Ohio

### LATHES, Toolroom—See Lathes, Engine, Toolroom

### LATHES, Turret, Automatic

Atlas Press Co., Kalamazoo, Mich.  
 Bullard Co., Bridgeport 2, Conn.  
 Cosg Corp., 405 Lexington Ave., New York 17, N. Y.  
 Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.  
 Jones & Lamson Mch. Co., 512 Clinton St., Springfield, Vt.  
 King Machine Tool Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio  
 National Acme Co., 170 E. 131st St., Cleveland 3, Ohio  
 New Britain Mch. Co., New Britain-Gridley Div., New Britain, Conn.

### LATHES, Turret, Ram Type, Saddle Type

Atlas Press Co., Kalamazoo, Mich.  
 Bardens & Oliver Inc., Ft. W. 9th St., Cleveland 13, Ohio  
 Bullard Co., Bridgeport 2, Conn.  
 Cosg Corp., 405 Lexington Ave., New York 17, N. Y.  
 Delta Power Tool Div., Rockwell Mfg. Co., Pittsburgh, Pa.  
 Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.  
 Hardinge Brothers, Inc., 1420 College Ave., Elmira, N. Y.  
 Jones & Lamson Mch. Co., 512 Clinton St., Springfield, Vt.  
 Levin & Son, Inc., Louis, Los Angeles 8, Calif.  
 Morey Machinery Co., 383 Lafayette St., New York 3, N. Y.  
 New Britain Mch. Co., New Britain-Gridley Div., New Britain, Conn.  
 Seewald Inc., 1956 Woodbridge Ave., New Brunswick, N. J.  
 Seneca Falls Mch. Co., Seneca Falls, N. Y.  
 Sheldon Mch. Co., Inc., 4258 N. Knox Ave., Chicago 41, Ill.  
 South Bend Lathe Wks., South Bend 22, Ind.  
 Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio

### LATHES, Turret Vertical—See Boring Mills, Vertical

### LAYOUT and DRAFTING TOOLS

Brown & Sharpe Mfg. Co., 235 Promenade St., Providence 1, R. I.  
 Lufkin Rule Co., Saginaw, Mich.  
 Starrett, L. S., Co., Athol, Mass.

### LEVELS

Lufkin Rule Co., Saginaw, Mich.  
 South Bend Lathe Wks., South Bend 22, Ind.  
 Starrett, The L. S., Co., Athol, Mass.

### LIGHTS, Indicator

General Electric Co., Schenectady, N. Y.

### LIMIT SWITCHES—See Switches, Limit

### LUBRICATING OILS and GREASES

Cities Service Oil Co., 70 Pine St., New York, N. Y.  
 Shell Oil Co., 50 W. 50th St., New York, N. Y.

Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.  
 Stuart, D. A. Oil Co. Ltd., 2727 S. Troy St., Chicago 23, Ill.  
 Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.  
 Texas Co., 135 E. 42nd St., New York, N. Y.

### LUBRICATING SYSTEMS

Farval Corp., 3249 E. 80th St., Cleveland, Ohio  
 Gils Bros. Mfg. Co., 1846 S. Kilbourn Ave., Chicago 23, Ill.  
 Madison-Kipp Corp., Madison, Wis.  
 Onsrud Machine Works, Inc., Niles, Ill.

### MACHINERY, Used and Rebuilt

Eastern Mchry. Co., 1000 Tennessee Ave., Cincinnati, Ohio  
 Miles Mchry. Co., 2025 E. Genesee Ave., Saginaw, Mich.  
 Van Keuren Co., Watertown 72, Mass.  
 Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

### MACHINISTS' SMALL TOOLS

Brown & Sharpe Mfg. Co., 235 Promenade St., Providence 1, R. I.  
 Lufkin Rule Co., Saginaw, Mich.  
 Niogara Mch. & Tool Wks., 637-697 Northland Ave., Buffalo 11, N. Y.  
 Starrett, The L. S., Co., Athol, Mass.

### MANDRELS—See Arbors and Mandrels

### MARKING MACHINES and DEVICES

Colonial Brooch & Machine Co., P. O. Box 37, Harper Sta., Detroit 13, Mich.  
 Gorton Mch. Co., 1321 Racine St., Racine, Wis.

### MATERIAL-HANDLING TRUCKS—See Trucks, Material Handling

### MEASURING MACHINES

Sheffield Corp., 721 Springfield St., Dayton 1, Ohio  
 Van Keuren Co., Watertown 72, Mass.

### MEASURING WIRES, Thread, Spline, Gear

Sheffield Corp., Dayton 1, Ohio  
 Threadwell Tap & Die Co., 16 Arch St., Greenfield, Mass.  
 Van Keuren Co., Watertown 72, Mass.

### MICROMETER HEADS

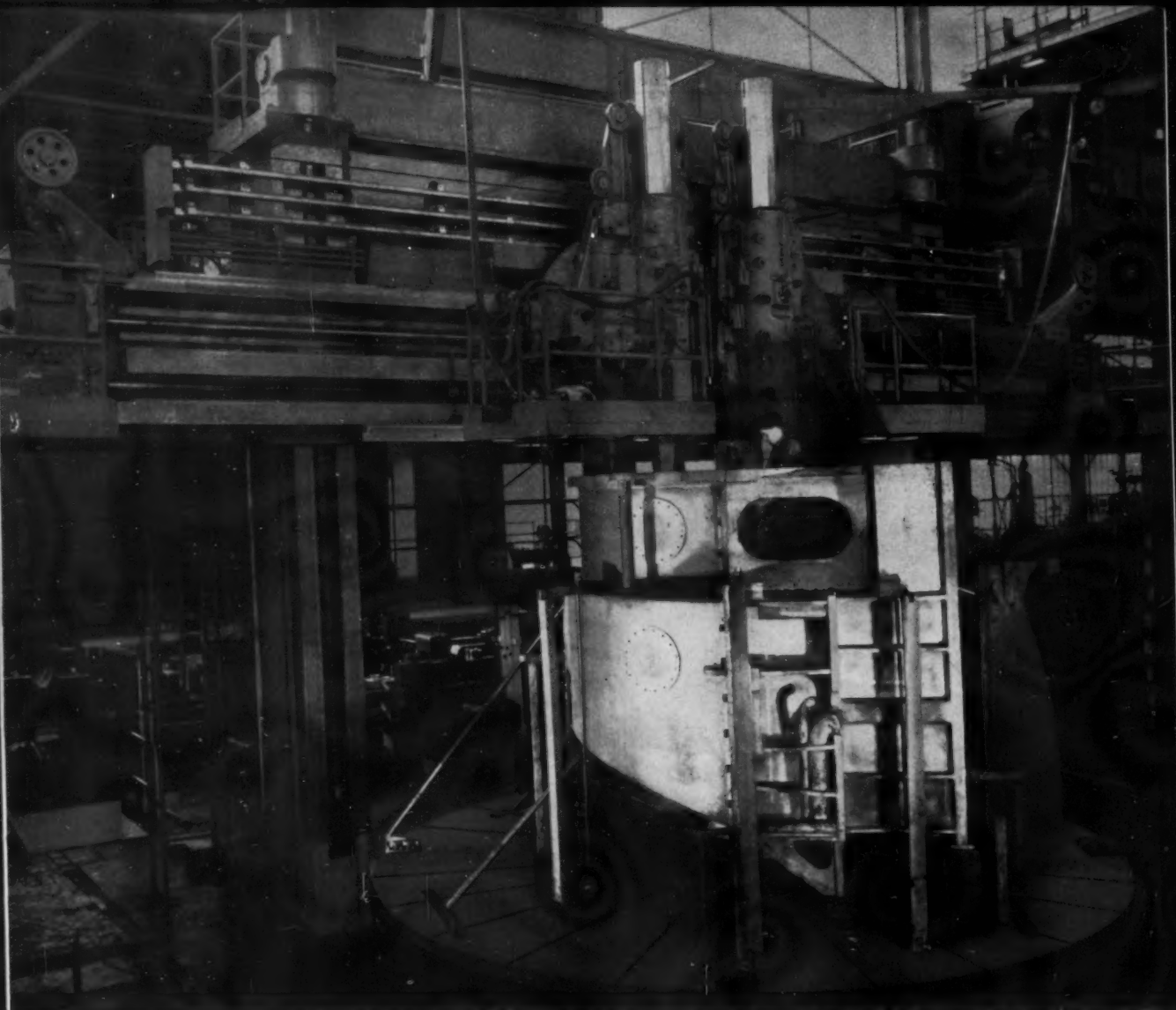
Brown & Sharpe Mfg. Co., 235 Promenade St., Providence 1, R. I.  
 DoAll Co., Des Plaines, Ill.  
 Starrett, The L. S., Co., Athol, Mass.

### MICROMETERS, Outside, Inside, Depth

Brown & Sharpe Mfg. Co., Providence, R. I.  
 DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.  
 Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.  
 Starrett, The L. S., Co., Athol, Mass.  
 Van Keuren Co., Watertown 72, Mass.

### MICROSCOPES, Toolmakers'

Bausch & Lomb Optical Co., Rochester, N. Y.  
 DoAll Co., Des Plaines, Ill.  
 Opto-Metric Tools, Inc., 137 Varick St., New York, N. Y.  
 Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.



## Mammoth 24 ft. Niles boring mill recently installed at Blaw-Knox, E. Chicago

One of the largest boring mills ever installed in the Greater Chicago area was put into operation recently in the Foundry & Mill Division of the Blaw-Knox Co. To meet the customer's exacting specifications, this huge Hamilton-built Niles machine tool is equipped to provide 16 changes of both bar and saddle feed, in a range from .005 to 1 in. per revolution of table. All speeds and feeds are controlled electrically from a convenient push-button pendant.

This mill can accommodate work pieces up to 320,000 lb. at all table speeds (from .16 to 18 rpm). Its double pinion drive is powered by two 125 hp d-c motors, with rpm adjustable through a 300/1200 range. Many other features of this precision-made machine tool add up to the maximum in efficiency and work output. Let us discuss your next machine tool requirement with you; our experience over a century could save you thousands of dollars.

**Hamilton Division** Hamilton, Ohio  
**BALDWIN · LIMA · HAMILTON**

Diesel engines • Mechanical and hydraulic presses • Can making machinery • Machine tools



# NEW... LOW...



only 2 $\frac{7}{8}$   
inches high!

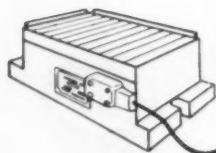
## MAGNA-LOCK model L ELECTROMAGNETIC CHUCKS

7 SIZES  
TO CHOOSE  
FROM...

5" x 10"  
6" x 12"  
6" x 18"  
8" x 18"  
8" x 24"  
10" x 15"  
10" x 16"

Now you can have more working height under the grinding wheel and still get the advantages of Magna-Lock fine pole laminated top construction — 22% more holding area than other types — work pieces held securely even at extreme edges of top plate.

These new chucks feature famous Magna-Lock holding power and rugged, all-steel, welded, precision construction. They'll bring new cost cutting versatility to your tool room and your production machining operations. It will pay you to investigate these new Magna-Lock Model L chucks. *Do it today!* Write Dept. M-107.



**Hanchett MAGNA-LOCK**  
CORPORATION

BIG RAPIDS, MICHIGAN, U. S. A.

designers and makers of a complete line of magnetic chucks and devices.

### MILLING MACHINE ATTACHMENTS

Bridgeport Mch., Inc., 500 Lindley St., Bridgeport 6, Conn.  
Brown & Sharpe Mfg. Co., Providence, R. I.  
Cincinnati Milling & Grinding Mch., Inc., 4701 Marburg Ave., Cincinnati 9, Ohio  
G & L and Hypra Div., Giddings & Lewis Mch. Tool Co., Fond du Lac, Wis.  
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.  
Greaves Mch. Tool Div., 2011 Eastern Ave., Cincinnati 2, Ohio  
Hardinge Bros., Inc., 1420 College Ave., Elmira, N. Y.  
Homestrand, Inc., Larchmont, N. Y.  
Kearney & Trecker Corp., Milwaukee, Wis.  
Sheldon Mch. Co., Inc., 4258 N. Knox Ave., Chicago 41, Ill.  
Van Norman Co., 3640 Main St., Springfield 7, Mass.

### MILLING MACHINES, Automatic

Cincinnati Milling Machine Co., Cincinnati, Ohio  
Consolidated Machine Tool Corp., Rochester, N. Y.  
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.  
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.  
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.  
Kearney & Trecker Corp., Milwaukee, Wis.  
Marac Machinery Corp., Yonkers, N. Y.  
Milholland, W. K., Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.  
Prest & Whitney Co., Inc., West Hartford, Conn.  
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.  
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.  
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

### MILLING MACHINES, Bench, Hand

Atlas Press Co., Kalamazoo, Mich.  
Hardinge Bros., Inc., 1420 College Ave., Elmira, N. Y.  
Morris, Robert E. Co., W. Hartford, Conn.

### MILLING MACHINES, Bed Type, Simplex, Duplex

Brown & Sharpe Mfg. Co., 235 Provenance St., Providence 1, R. I.  
Cincinnati Milling & Grinding Mch., Inc., 4701 Marburg Ave., Cincinnati 9, Ohio  
Consolidated Mch. Tool Div., Blossom Road, Rochester 10, N. Y.  
Espin-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa.  
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.  
Kearney & Trecker Corp., Milwaukee, Wis.  
Morey Machinery Co., 383 Lafayette St., New York 3, N. Y.  
Morris, Robert E. Co., W. Hartford, Conn.  
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.  
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.  
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.  
Van Norman Co., 3640 Main St., Springfield 7, Mass.

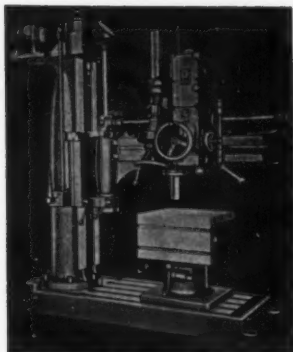
### MILLING MACHINES, Circular, Continuous

Consolidated Mch. Tool Corp., Rochester, N. Y.  
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.  
Espin-Lucas Mch. Works, Front St., and Girard Ave., Philadelphia, Pa.  
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.  
Kearney & Trecker Corp., Milwaukee, Wis.  
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.  
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

### MILLING MACHINES, Die Sinking, Duplicating, Profiling

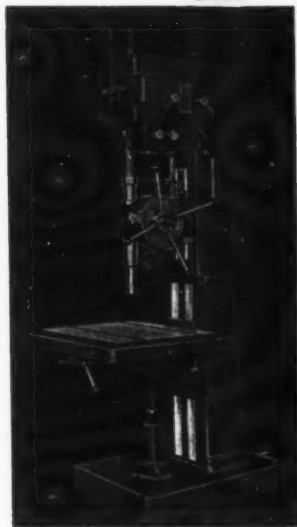
Arrow Engineering Co., Inc., 120 E. Market St., Indianapolis, Ind.  
Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Calif.  
Bridgeport Mch., Inc., 500 Lindley St., Bridgeport 6, Conn.  
Cincinnati Milling & Grinding Mch., Inc., 4701 Marburg Ave., Cincinnati 9, Ohio  
Colonial-Romulus Div., Parkgrove Station, Detroit 5, Mich.  
Consolidated Mch. Tool Div., Blossom Road, Rochester 10, N. Y.  
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
Elox Corp. of Mich., 1830 Stephenson Highway, Royal Oak 3, Mich.

(Continued on page 342)

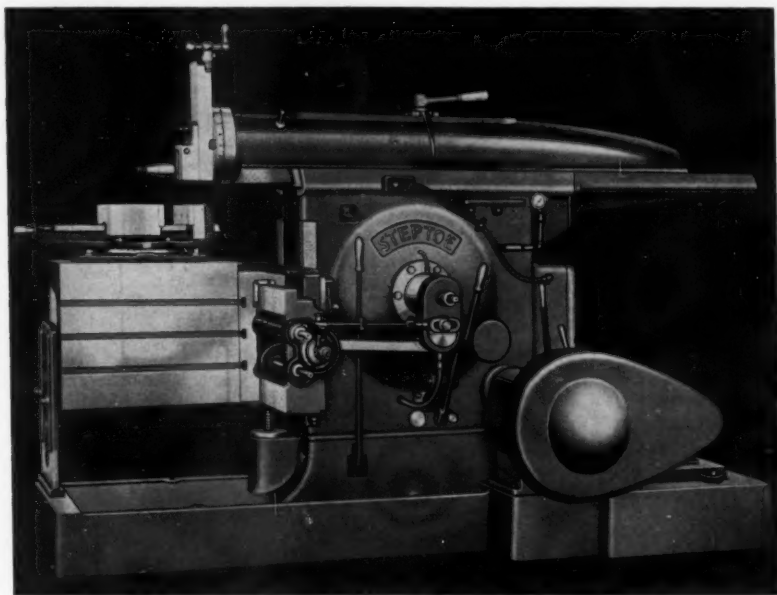


**WESTERN RADIAL DRILLS**—Heavy Duty, 3 to 8 ft., 16 or 32 speeds. High Speed, 3 to 6 ft., 6, 9, 12 or 18 speeds.

# THE BIG 4 WESTERN LINE



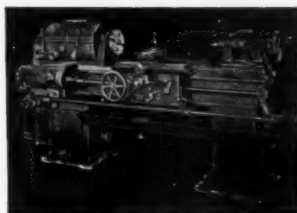
**WESTERN UPRIGHT DRILLS**—Single or multiple spindle; 18 speeds; 9 feeds; all geared; up to 2½" capacity.



**"RELIABLE—SINCE 1895"**

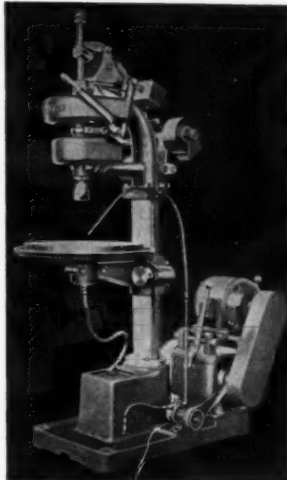
**STEPTOE SHAPERS**—Heavy Duty — 4 or 8 speeds — Timken bearing equipped—14", 16", 20" and 24" sizes.

**STEPTOE-WESTERN SHAPERS** — Medium duty—4, 9 or 18 speeds up to 200 strokes per minute—12" and 15" sizes.



**CHARD LATHES** — Quick change, geared head; 16", 18" and 20" swing, 8 or 12 speeds.

**GARVIN AUTOMATIC TAPPERS**—Up to 3" pipe tap capacity; four spindle speeds.



**STEPTOE HEAVY DUTY SHAPERS** have proven, accurate features, with a simplicity of component parts and absence of gadget attachments, and therefore have a very low maintenance cost and long life. All drive shafts, and the bull gear, are mounted on Timken bearings within dust-proof housings, and are supplied with an automatic forced feed lubricating system when so ordered. All gears within the speed box are of alloy steel, generated on Fellows Shapers, and chamfered where required for easy sliding engagement. Four speed changes within the speed box, combined with sliding back gears within the column, produce eight ram speeds in progression. All speed changes may be made while the machine is running, without clashing of different gear ratios. Also available in 12" & 15" High Speed, medium duty type, up to 200 strokes per minute—Full line of accessories.

For more information on these and other machines in the Big 4 line write for catalogs.

**MANUFACTURED BY**

**WESTERN MACHINE TOOL WORKS  
HOLLAND, MICHIGAN, U.S.A.**



# VIKING PUMPS

any way you  
want them



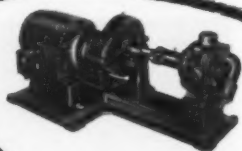
stripped models

The internal working parts of original "gear within a gear" Viking pumps are available to fit into your integral casing. Conserves space, piping arrangement, drive equipment, etc. Available in 2/3, 1-1/2, 3-1/2, 5, 10, 18 GPM and larger. Positive, self-priming, capable of handling all types of liquids up to several hundred pounds discharge pressure, in many models.



custom models

No matter how you wish to apply the positive self-priming Viking pump, it can be custom built in the size and casing design to fit your piping and drive arrangement. Thousands of individual problems have been successfully answered with specially designed Viking "Gear-within-a-gear" pumps.



standard models

Pick any standard Viking pump in 21 sizes from 2/3 to 1050 GPM, in many types of mounting and drive arrangements. They are available from over 750 cataloged models.

Send your pumping problem today and ask for bulletin 575J.



**VIKING PUMP CO.**

Cedar Falls, Iowa, U.S.A.

In Canada, it's "ROTO-KING" pumps

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G & L and Hypro Div., Giddings & Lewis Mch. Tool Co., Fond du Lac, Wis.  
Gorton, George, Machine Co., 1110 W. 13th St., Racine, Wis.  
Kearney & Trecker Corp., Milwaukee, Wis.  
Morey Machinery Co., 383 Lafayette St., New York 3, N. Y.  
Onsrud Machine Works, Inc., Niles, Ill.  
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.  
Russell, Holbrook & Henderson, Inc., 292 Madison Ave., New York 17, N. Y.  
Sundstrand Mch. Tool Co., 2531 - 11th St., Rockford, Ill.

## MILLING MACHINES, Knee Type, Horizontal, Plain, Universal

Aaron Machinery Co., Inc., 45 Crosby St., New York 12, N. Y.  
Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y.  
Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Calif.  
Brown & Sharpe Mfg. Co., Providence, R. I.  
Bullard Co., Bridgeport 6, Conn.  
Cincinnati Milling & Grinding Mches., Inc., 4701 Marburg Ave., Cincinnati 9, Ohio  
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
DeVlieg Machine Co., Ferndale, Mich.  
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.  
Greaves Machine Tool Div., 2009 Eastern Ave., Cincinnati, Ohio  
Hardinge Bros., Inc., 1420 College Ave., Elmhurst, N. Y.  
Homestrand, Inc., Larchmont, N. Y.  
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.  
Kearney & Trecker Corp., Milwaukee, Wis.  
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.  
Sheldon Machine Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.  
Van Norman Co., 3640 Main St., Springfield 7, Mass.

## MILLING MACHINES, Knee Type Rise and Fall

Cincinnati Milling & Grinding Mches., Inc., 4701 Marburg Ave., Cincinnati 9, Ohio  
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
Homestrand, Inc., Larchmont, N. Y.  
Kearney & Trecker Corp., Milwaukee, Wis.  
Nichols-Morris Corp., 76 Mamaroneck Ave., White Plains, N. Y.  
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.

## MILLING MACHINES, Knee Type Ram

Aaron Machinery Co., Inc., 45 Crosby St., New York 12, N. Y.  
Brown & Sharpe Mfg. Co., 235 Promenade St., Providence 1, R. I.  
Gorton Mch. Co., 1321 Racine St., Racine, Wis.  
Kearney & Trecker Corp., Milwaukee, Wis.  
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.  
Van Norman Co., 3640 Main St., Springfield 7, Mass.

## MILLING MACHINES, Knee Type Vertical

Aaron Machinery Co., Inc., 45 Crosby St., New York 12, N. Y.  
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
Gorton Mch. Co., 1321 Racine St., Racine, Wis.

## MILLING MACHINES, Knee Type, Vertical

Aaron Machinery Co., Inc., 45 Crosby St., New York 12, N. Y.  
Atlas Press Co., Kalamazoo, Mich.  
Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y.  
Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Calif.  
Bridgeport Mches., Inc., 500 Lindley St., Bridgeport 6, Conn.  
Brown & Sharpe Mfg. Co., Providence, R. I.  
Cincinnati Milling & Grinding Mches., Inc., 4701 Marburg Ave., Cincinnati 9, Ohio  
Cosa Corp., 450 Lexington Ave., New York 17, N. Y.  
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.  
Homestrand, Inc., Larchmont, N. Y.  
Kearney & Trecker Corp., Milwaukee, Wis.  
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.  
Russell, Holbrook & Henderson, Inc., 292 Madison Ave., New York 17, N. Y.  
South Bend Lathe Wks., South Bend 22, Ind.

## MILLING MACHINES, Planer Type

Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio  
Consolidated Mch. Tool Div., Blossom Road, Rochester 10, N. Y.  
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
Espan-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa.  
G & L and Hypro Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.  
Gray, G. A., Co., Woodburn Ave. and Penn R., Evanston, Cincinnati, Ohio  
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.  
Kearney & Trecker Corp., Milwaukee, Wis.  
Morey Machinery Co., 383 Lafayette St., New York 3, N. Y.  
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.  
Sundstrand Mch. Tool Co., 2531 - 11th St., Rockford, Ill.

## MILLING MACHINES, Spar

Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio  
Cincinnati Milling & Grinding Mches., Inc., 4701 Marburg Ave., Cincinnati 9, Ohio  
G & L and Hypro Div., Giddings & Lewis Mch. Tool Co., Fond du Lac, Wis.  
Kearney & Trecker Corp., Milwaukee, Wis.  
Morey Machinery Co., 383 Lafayette St., New York 3, N. Y.  
Sundstrand Mch. Tool Co., 2531 - 11th St., Rockford, Ill.

## MILLING MACHINES, Thread

Hanson-Whitney Co., 169 Bartholomew Ave., Hartford 3, Conn.

## MOLDING MACHINES, Plastic

Baker Bros., Inc., 1000 Post St., Toledo 10, Ohio  
Elmes Eng. Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio  
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.  
Hydraulic Press Mfg. Co., Mount Gilead, Ohio  
Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.  
Watson-Stillman Co., Roselle, N. J.

## MOTOR, AIR

Ingersoll-Rand Co., Phillipsburg, N. J.

## MOTORS, Electric

Allis-Chalmers Mfg. Co., Milwaukee, Wis.  
Delta Power Tool Div., Rockwell Mfg. Co., Pittsburgh, Pa.  
General Electric Co., Schenectady, N. Y.  
Howell Electric Motors Co., Howell, Mich.  
Lincoln Electric Co., Cleveland 17, Ohio  
Reliance Electric & Engrg. Co., 1074 Ivanhoe Rd., Cleveland 10, Ohio

## MOTORS, Hydraulic

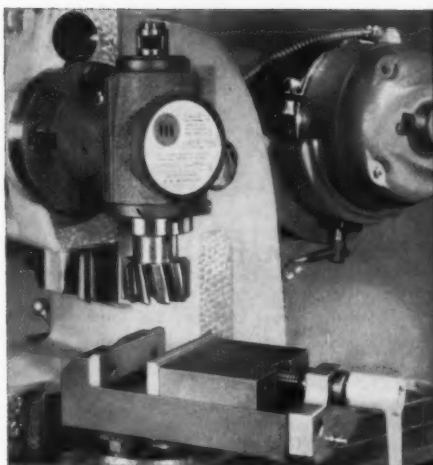
Barnes, J. S., Corp., Rockford, Ill.  
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
Hydraulic Press Mfg. Div., Mt. Gilead, Ohio  
Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.  
Sundstrand Mch. Tool Co., 2531 - 11th St., Rockford, Ill.  
Vickers, Inc., Detroit 32, Mich.

## MULTIPLE INSPECTION GAGES—See Gages, Multiple Inspection

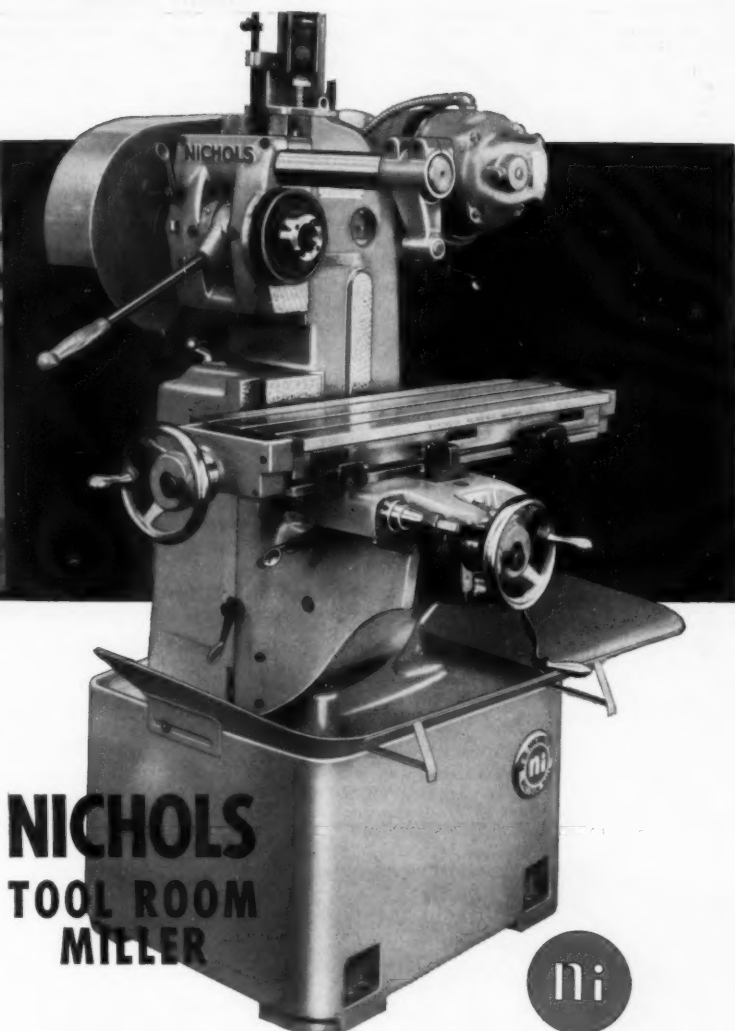
## MULTIPLE-STATION MACHINES, Dial Type

Avey Drilling Mch. Co., 25 E. 3rd St., Covington, Ky.  
Baker Bros., Inc., 1000 Post St., Toledo 10, Ohio  
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.  
Baush Mch. Tool Co., 15 Wason Ave., Springfield, Mass.  
Cross Co., 3250 Bellevue, Detroit 7, Mich.  
Etco Tool Co., Inc., 594 Johnson Ave., Brooklyn 37, N. Y.  
Federal Prod. Corp., 1144 Eddy St., Providence 1, R. I.  
Greenlee Bros. & Co., 2136 - 12th St., Rockford, Ill.  
Hartford Special Machinery Co., 287 Homestead Ave., Hartford, Conn.  
Kingsbury Mch. Tool Corp., Keene, N. H.  
LaSalle Tool, Inc., 3840 E. Outer Drive, Detroit 34, Mich.  
Modern Industrial Engrg. Co., 14230 Birwood Ave., Detroit 38, Mich.

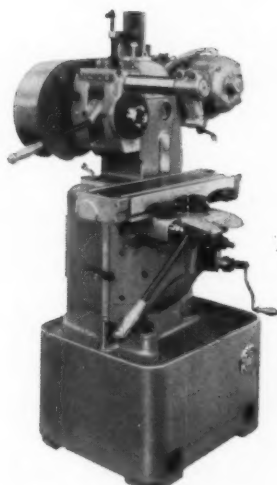
(Continued on page 344)



**STURDY NICHOLS VERTICAL HEAD**  
 . . . has No. 40 Taper Spindle  
**NICHOLS SWIVEL VISE** is a true precision unit equipped with verniers . . . only two of many available accessories.



## NICHOLS TOOL ROOM MILLER



**STANDARD MODEL**—A precise, versatile Hand Miller with Rise and Fall spindle. Table size 6 $\frac{3}{4}$ " x 21"

### ACCURACY—SENSITIVITY—VERSATILITY

Gives the tool room what it demands—a compact, rugged miller with extreme accuracy and utmost flexibility. The Nichols TOOL ROOM MILLER is arranged for sensitive hand screw feed, has generous table surface—8 $\frac{1}{2}$ " x 30" with 19" longitudinal travel. Precision feed screws have oversize, easy reading micrometer dials. Large hand wheels provide element of "feel" so important in precision milling. Rise-and-Fall Spindle simplifies set-ups. Lever table feed, furnished in addition to screw feed, increases usefulness. Selective speed ranges up to 5000 RPM.

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**THE ROBERT E. MORRIS COMPANY**

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National Automatic Tool Co., S. 7th N. Sts., Ave., Detroit 7, Mich.  
 Snyder Tool & Engrg. Co., 3400 E. Lafayette Richmond, Ind.  
 Sundstrand Mch. Tool Co., 2531 - 11th St., Rockford, Ill.  
 Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.

#### MULTIPLE-STATION MACHINES, Transfer Type

Avey Drilling Mch. Co., 25 E. 3rd St., Covington, Ky.  
 Baker Bros., Inc., 1000 Post St., Toledo 10, Ohio  
 Barnes Drill Co., 814 Chestnut St., Rockford, Ill.  
 Baush Mch. Tool Co., 15 Wason Ave., Springfield, Mass.  
 Buhr Mch. Tool Co., 839 Green St., Ann Arbor, Mich.  
 Bullard Co., Bridgeport 6, Conn.  
 Cincinnati Milling Mch. Co., Cincinnati 9, Ohio  
 Clearing Mch. Corp., 6499 W. 65th St., Chicago 38, Ill.  
 Davis & Thompson Co., 4460 N. 124th St., Milwaukee 10, Wis.  
 Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
 Greenlee Bros. & Co., 2136 - 12th St., Rockford, Ill.  
 Hartford Special Machinery Co., 287 Homestead Ave., Hartford, Conn.  
 Heald Machine Co., 10 New Bond St., Worcester 6, Mass.  
 Kearney & Trecker Corp., Milwaukee, Wis.  
 La Salle Tool, Inc., 3840 E. Outer Drive, Dearborn, Mich.  
 Le Maire Tool & Mfg. Co., Dearborn, Mich.  
 Modern Industrial Engrg. Co., 14230 Birwood Ave., Detroit 38, Mich.  
 Moline Tool Co., 102-20th St., Moline, Ill.  
 National Automatic Tool Co., S. 7th N. Sts., Richmond, Ind.  
 Norton Co., 1 New Bond St., Worcester 6, Mass.

Snyder Tool & Engrg. Co., 3400 E. Lafayette Ave., Detroit 7, Mich.  
 Sundstrand Mch. Tool Co., 2531 - 11th St., Rockford, Ill.  
 Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.

#### NIBBLING MACHINES

Fenway Machine Co., Inc., Willow Grove, Penna.  
 Thor Power Tool Co., Prudential Plaza, Chicago 1, Ill.  
 Wales-Strippit Corp., Akron, N. Y.

#### NICKEL AND NICKEL ALLOYS

Crucible Steel Co. of America, Henry W. Oliver Bldg., Mellon Square, Pittsburgh 22, Pa.

#### NUT SETTERS—See Screwdrivers, etc.

#### NUTS—See Bolts, Nuts and Screws

#### OIL GROOVERS

Wicaco Machine Corp., Wayne Junction, Philadelphia, Pa.

#### OILERS AND LUBRICATORS

Gits Bros. Mfg. Co., 1858 S. Kilbourn Ave., Chicago, Ill.  
 Madison-Kipp Corp., Madison, Wis.  
 Wicaco Mch. Corp., Philadelphia, Pa.

#### OILS, CUTTING SOLUBLE—See Cutting and Grinding Fluids

#### OILS, Lubricating—See Lubricating Oils and Greases

#### OILS, Quenching and Tempering

Cities Service Oil Co., 70 Pine St., New York, N. Y.  
 Shell Oil Co., 50 W. 50th St., New York, N. Y.  
 Sinclair Refining Co., 600 - 5th Ave., New York, N. Y.  
 Standard Oil Co. (Indiana), 910 S. Michigan Ave., Chicago 80, Ill.  
 Sun Oil Co., 1608 Walnut St., Philadelphia 3, Pa.

#### OPTICAL FLATS

Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill.  
 DoAll Co., Des Plaines, Ill.  
 Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.  
 Van Keuren Co., Watertown 72, Mass.

#### PACKING, Leather, Metal, Rubber Asbestos, Etc.

Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill.  
 Watson-Stillman Co., Roselle, N. J.

#### PAINTING EQUIPMENT, Spray—See Spraying Equipment, Metal

#### PARALLELS

Brown & Sharpe Mfg. Co., Providence, R. I.  
 DoAll Co., Des Plaines, Ill.  
 G & L and Hypro Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.  
 Lufkin Rule Co., Saginaw, Mich.  
 Starrett, The L. S., Co., Athol, Mass.  
 Walker, O. S., Co., Inc., Worcester, Mass.

#### PATTERNS, Wood and Metal

Mummert-Dixon Co., Hanover, Pa.

#### PIPE, Steel, Stainless, etc.

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.  
 Babcock & Wilcox Co. (Tubular Prod. Div.), Beaver Falls, Penna.  
 Bethlehem Steel Co., Bethlehem, Pa.  
 Carpenter Steel Co., 105 W. Bern St., Reading, Pa.  
 Crucible Steel Co. of America, Henry W. Oliver Bldg., Mellon Square, Pittsburgh 22, Pa.  
 Ryerson, Joseph T. & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.  
 United States Steel Corp., National Tube Co., Div., 436 7th Ave., Pittsburgh, Pa.

#### PIPE AND TUBING MILLS, Electric-weld

Yoder Co., 5504 Walworth Ave., Cleveland 2, Ohio

#### PIPE AND TUBING, Brass and Copper

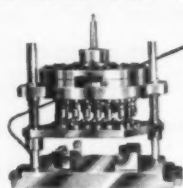
American Brass Co., 25 Broadway, New York, N. Y.  
 Mueller Brass Co., 1925 Lapeer Ave., Port Huron, Mich.  
 Revere Copper & Brass, Inc., 230 Park Ave., New York 17, N. Y.

FOR MULTIPLE DRILLING OF HOLES  
 ON PRODUCTION RUNS

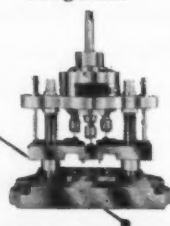
## ERRINGTON

FIXED CENTER DRILLING HEADS  
 with JIGS and FIXTURES

Do more . . . and do it better with Errington Fixed Center Drilling Heads. They drill any number of varied size holes on different elevations. The head has grooved thrust ball bearings at all thrust points and hardened bronze radial bearings. Heat treated spindles and gears of one piece turned from solid bar stock. It is geared approximately 2:1. All enclosed in a sand-cast aluminum case and cover, with alemite pressure lubrication.



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 Send Blueprint for  
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 Obligation.



Write for Complete Information

**ERRINGTON Mechanical Laboratory, Inc.**

Established 1891

Main Office and Plant STATEN ISLAND 4, NEW YORK

**MULTIPRESS**  
boosts quality  
in rifle grenade  
production  
at **SMP**  
**COMPANY**

The M-31, new Army rifle grenade produced by the SMP Company of Portland, Oregon, gets a big assist from Denison's hydraulic Multipress.

Seventeen inches over-all, the grenade consists of nose, body assembly, and fin or stabilizer assembly.

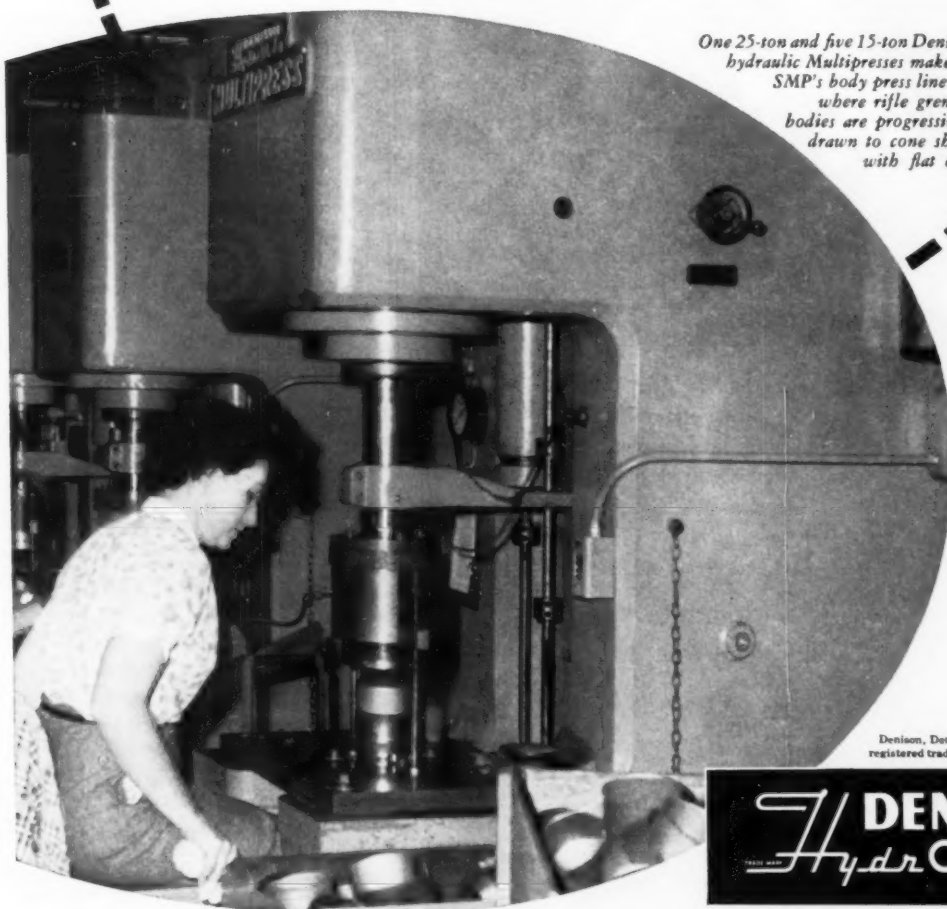
Denison Multipresses are used singly or in rows throughout the plant depending upon the complexity of the job. Operations include drawing, sizing, broaching, punching . . . and, of course, assembly.

Multipress contributes to fast, efficient production, with greatly improved quality an important benefit.

Datalog MUL-4 describes in detail the operations performed by Multipress for the SMP Company.

For a free copy, and for information on Denison's complete line of hydraulic Multipresses, write Denison Engineering Division, American Brake Shoe Co., 1152 Dublin Rd., Columbus 16, Ohio.

*One 25-ton and five 15-ton Denison hydraulic Multipresses make up SMP's body press line . . . where rifle grenade bodies are progressively drawn to cone shape with flat end.*



Denison, Denison HydrOILics, and Multipress are registered trademarks of Denison Eng. Div., ABSCO



Denison makes a complete line of hydraulic presses • pumps • motors • controls

For more information fill in page number on Inquiry Card, on page 237

MACHINERY, October, 1957—345



**PIPE THREADING AND CUTTING MACHINES**

Davis & Thompson Co., 4460 N. 124th St., Milwaukee 10, Wis.  
Landis Machine Co., Inc., Waynesboro, Pa.  
Sheffield Machine Co., Inc., Waynesboro, Pa.

**PLANER JACKS—See Set-up Equipment****PLANERS, Double Housing and Openside**

Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio  
Consolidated Mch. Tool Div., Rochester, N. Y.  
G & L and Hypro Div., Gliddings & Lewis Machine Tool Co., Fond du Lac, Wis.  
Gray, G. A. Co., 3611 Woodburn Ave., Cincinnati, Ohio  
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.  
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.

Seewald Inc., 1956 Woodbridge Ave., New Brunswick, N. J.

**PLASTICS AND PLASTIC PRODUCTS**

Dow Chemical Co., Midland, Mich.  
Eastman Kodak Co., 343 State St., Rochester 4, N. Y.  
Gisholt Mch Co., Madison, Wis.  
U. S. Steel Corp., Nat'l Tube Div., Pittsburgh, Pa.

**PRESS BRAKES—See Brakes, Presses and Bending****PRESS FEEDER, Automatic**

Bliss Co., E. W., Canton, Ohio  
Federal Press Co., 511 Division St., Elkhart, Ind.  
Nilson, A. H. Machine Co., Bridgeport, Conn.  
Producto Machine Co., 985 Hausatonic Ave., Bridgeport 1, Conn.  
U. S. Tool Co., East Orange, N. J.

**PRESSES, Arbor**

Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.  
Elmes Eng. Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio  
Famco Machine Co., Kenosha, Wis.  
Hannifin Corp., 510 S. Wolf Rd., Des Plaines, Ill.  
Logansport Machine Co., Inc., Logansport, Ind.  
Threadwell Tap & Die Corp., 16 Arch St., Greenfield, Mass.  
Watson-Stillman Co., Roselle, N. J.  
Wilson, K. R., Inc., Arcade, N. Y.

**PRESSES, Assembling**

Alva Allen Industries, Clinton, Mo.  
Bliss, E. W. Co., 1375 Raff Rd. S. W., Canton, Ohio  
Colonial Broach & Machine Co., Box 37, Detroit 13, Mich.  
Detroit Broach Co., Inc., 950 S. Rochester Rd., Rochester, Mich.  
Elmes Eng. Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio  
Federal Press Co., 511 Division St., Elkhart, Ind.  
Ferracute Machine Co., Bridgeton, N. J.  
Hannifin Corp., 510 S. Wolf Rd., Des Plaines, Ill.  
Hydraulic Press Mfg. Co., Mount Gilead, Ohio  
Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.

**PRESSES, Blanking, Stamping**

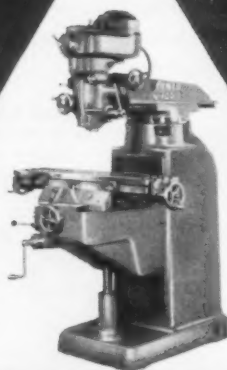
Alva Allen Industries, Clinton, Mo.  
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.  
Bath, Cyril Co., 32324 Solon Rd., Solon, Ohio  
Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.  
Bliss, E. W. Co., 1375 Raff Rd. S. W., Canton, Ohio  
Chambersburg Engineering Co., Chambersburg, Pa.  
Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.  
Cleveland Crane & Engineering Co., Wickliffe, Ohio  
Cleveland Punch & Shear Wks. Co., 3917 St. Clair Ave., Cleveland 14, Ohio  
Danly Machine Specialties, Inc., 2100 S. Laramie, Chicago 50, Ill.  
Federal Machine & Welder Co., 1745 Overland Ave. N. E., Warren, Ohio  
Federal Press Co., 511 Division St., Elkhart, Ind.  
Ferracute Machine Co., Bridgeton, N. J.  
Hydraulic Press Mfg. Co., Mount Gilead, Ohio  
L & J Press Corp., 1631 Sterling Ave., Elkhart, Ind.  
Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.  
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Minster Machine Co., Minster, Ohio  
Niagara Machine & Tool Wks., 637 Northland Ave., Buffalo 11, N. Y.  
U. S. Tool Co., Inc., 55 N. 18th St., East Orange, N. J.  
V & O Press Co., Hudson, New York  
Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.  
Wilson, K. R., Inc., Arcade, N. Y.

**PRESSES, Briquetting**

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Elmes Eng. Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio  
Hydraulic Press Mfg. Co., Mount Gilead, Ohio  
Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.  
Wilson, K. R., Inc., Arcade, N. Y.

**PRESSES, Closed-Die Forging**

Ajax Manufacturing Co., 1441 Chardon Rd., Cleveland 17, Ohio  
Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.  
Bliss, E. W. Co., 1375 Raff Rd. S. W., Canton, Ohio  
Chambersburg Engineering Co., Chambersburg, Pa.  
Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.  
Elmes Eng. Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio  
Hydraulic Press Mfg. Co., Mount Gilead, Ohio  
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 Chambersburg Engineering Co., Chambersburg, Pa.  
 Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.  
 Cleveland Punch & Shear Wks. Co., 3917 St. Clair Ave., Cleveland 14, Ohio  
 Danly Machine Specialties, Inc., 2100 S. Laramie, Chicago 50, Ill.  
 Elmes Eng. Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio  
 Federal Machine & Welder Co., 1745 Overland Ave., N. E., Warren, Ohio  
 Ferracute Machine Co., Bridgeton, N. J.  
 Hydraulic Press Mfg. Co., Mount Gilead, Ohio  
 Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.  
 Minster Machine Co., Minster, Ohio  
 Niagara Machine & Tool Wks., 637 Northland Ave., Buffalo 11, N. Y.  
 Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.  
 Wilson, K. R., Inc., Arcade, N. Y.

**PRESSES, Die Sinking (Hobbing)**

Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.  
 Bliss, E. W. Co., 1375 Raff Rd., S. W., Canton, Ohio  
 Chambersburg Engineering Co., Chambersburg, Pa.  
 Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.  
 Elmes Eng. Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio  
 Hydraulic Press Mfg. Co., Mount Gilead, Ohio  
 Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.  
 Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.  
 Wilson, K. R., Inc., Arcade, N. Y.

**PRESSES, Die Tryout**

Bliss, E. W. Co., 1375 Raff Rd., S. W., Canton, Ohio  
 Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.  
 Cleveland Punch & Shear Wks. Co., 3917 St. Clair Ave., Cleveland 14, Ohio  
 Elmes Eng. Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio  
 Federal Machine & Welder Co., 1745 Overland Ave., N. E., Warren, Ohio  
 Federal Press Co., 511 Division St., Elkhart, Ind.  
 Ferracute Machine Co., Bridgeton, N. J.  
 Hannifin Corp., 510 S. Wolf Rd., Des Plaines, Ill.  
 Hydraulic Press Mfg. Co., Mount Gilead, Ohio  
 L & J Press Corp., 1631 Sterling Ave., Elkhart, Ind.  
 Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.  
 Minster Machine Co., Minster, Ohio  
 Niagara Machine & Tool Wks., 637 Northland Ave., Buffalo 11, N. Y.  
 Product Machine Co., 985 Housatonic Ave., Bridgeport 1, Conn.  
 Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.  
 Wilson, K. R., Inc., Arcade, N. Y.

**PRESSES, Drawing**

Alva Allen Industries, Clinton, Mo.  
 Baird Machine Co., 1700 Statford Ave., Stratford, Conn.  
 Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.  
 Bliss, E. W. Co., 1375 Raff Rd., S. W., Canton, Ohio  
 Cincinnati Milling & Grinding Machines, Inc., 4710 Marburg Ave., Cincinnati 9, Ohio  
 Clearing Machine Corp., 6399 W. 65th St., Chicago 38, Ill.  
 Cleveland Crane & Engineering Co., Wickliffe, Ohio  
 Cleveland Punch & Shear Wks. Co., 3917 St. Clair Ave., Cleveland 14, Ohio  
 Danly Machine Specialties, Inc., 2100 S. Laramie, Chicago 50, Ill.  
 Elmes Eng. Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio  
 Federal Machine & Welder Co., 1745 Overland Ave., N. E., Warren, Ohio  
 Ferracute Machine Co., Bridgeton, N. J.  
 Hydraulic Press Mfg. Co., Mount Gilead, Ohio  
 L & J Press Corp., 1631 Sterling Ave., Elkhart, Ind.  
 Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.  
 Minster Machine Co., Minster, Ohio  
 Niagara Machine & Tool Wks., 637 Northland Ave., Buffalo 11, N. Y.

Nilson, A. H. Machine Co., Bridgeport, Conn.  
 Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.  
 Wilson, K. R., Inc., Arcade, N. Y.

**PRESSES, Extrusion**

Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.  
 Bliss, E. W. Co., 1375 Raff Rd., S. W., Canton, Ohio  
 Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.  
 Danly Machine Specialties, Inc., 2100 S. Laramie, Chicago 50, Ill.  
 Elmes Eng. Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio  
 Federal Machine & Welder Co., 1745 Overland Ave., N. E., Warren, Ohio  
 Hydraulic Press Mfg. Co., Mount Gilead, Ohio  
 Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.  
 Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.

Watson-Stillman Co., Roselle, N. J.  
 Wilson, K. R., Inc., Arcade, N. Y.

**PRESSES, Foot**

Fanco Machine Co., Kenosha, Wis.  
 Ferracute Machine Co., Bridgeton, N. J.  
 Hydraulic Press Mfg. Co., Mount Gilead, Ohio  
 Niagara Machine & Tool Wks., 637 Northland Ave., Buffalo 11, N. Y.  
 Product Machine Co., 985 Housatonic Ave., Bridgeport 1, Conn.  
 Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.  
 Wilson, K. R., Inc., Arcade, N. Y.

**PRESSES, Horning**

Bliss, E. W. Co., 1375 Raff Rd., S. W., Canton, Ohio  
 Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.

(Continued on page 348)



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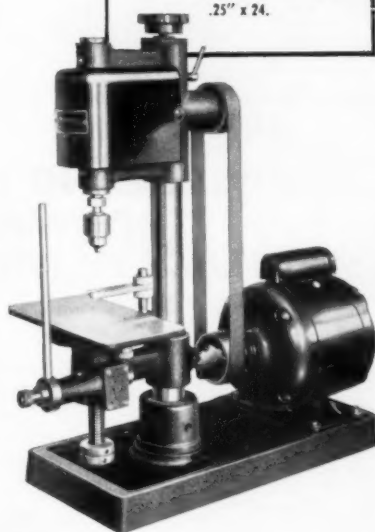
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 Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.  
 Minster Machine Co., Minster, Ohio  
 Niagara Machine & Tool Wks., 637 Northland Ave., Buffalo 11, N. Y.  
 V & O Press Co., Hudson, New York  
 Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.

**PRESSES, Notching**

Alva Allen Industries, Clinton, Mo.  
 Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.  
 Federal Machine & Welder Co., 1745 Overland Ave., N. E., Warren, Ohio

Ferracute Machine Co., Bridgeton, N. J.  
 Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.  
 Minster Machine Co., Minster, Ohio  
 Niagara Machine & Tool Wks., 637 Northland Ave., Buffalo 11, N. Y.  
 V & O Press Co., Hudson, New York  
 Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.  
 Wales-Strippit Corp., Akron, N. Y.  
 Wilson, K. R., Inc., Arcade, N. Y.

**PRESSES, Punching, Piercing**

Alva Allen Industries, Clinton, Mo.  
 Bath Cyril Co., 32324 Aurora Rd., Solon, Ohio  
 Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.  
 Bliss, E. W. Co., 1375 Raff Rd., S. W., Canton, Ohio  
 Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.  
 Cleveland Crane & Engineering Co., Wickliffe, Ohio

Cleveland Punch & Shear Wks. Co., 3917 St. Clair Ave., Cleveland 14, Ohio  
 Danly Machine Specialties, Inc., 2100 S. Laramie, Chicago 50, Ill.  
 Dries & Krump Mfg. Co., 7400 S. Loomis Blvd., Chicago 36, Ill.  
 Elmes Eng. Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio  
 Famco Machine Co., Kenosha, Wis.  
 Federal Machine & Welder Co., 1745 Overland Ave., N. E., Warren, Ohio  
 Federal Press Co., 511 Division St., Elkhart, Ind.  
 Ferracute Machine Co., Bridgeton, N. J.  
 Hannifin Corp., 510 S. Wolf Rd., Des Plaines, Ill.  
 L & J Press Corp., 1631 Sterling Ave., Elkhart, Ind.  
 Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.  
 Minster Machine Co., Minster, Ohio  
 Niagara Machine & Tool Wks., 637 Northland Ave., Buffalo 11, N. Y.  
 Nilson, A. H. Machine Co., Bridgeport, Conn.  
 Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.  
 Wales-Strippit Corp., Akron, N. Y.  
 Wiedemann Machine Co., 4272 Wissahicken Ave., Philadelphia 32, Pa.  
 Wilson, K. R., Inc., Arcade, N. Y.

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 Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.

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 Bliss, E. W. Co., 1375 Raff Rd., S. W., Canton, Ohio  
 Chambersburg Engineering Co., Chambersburg, Pa.  
 Cincinnati Milling & Grinding Machines, Inc., 4701 Marburg Ave., Cincinnati 9, Ohio  
 Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.  
 Elmes Eng. Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio  
 Hannifin Corp., 510 S. Wolf Rd., Des Plaines, Ill.  
 Hydraulic Press Mfg. Co., Mount Gilead, Ohio  
 Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.  
 Niagara Machine & Tool Wks., 637 Northland Ave., Buffalo 11, N. Y.  
 Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.  
 Wilson, K. R., Inc., Arcade, N. Y.

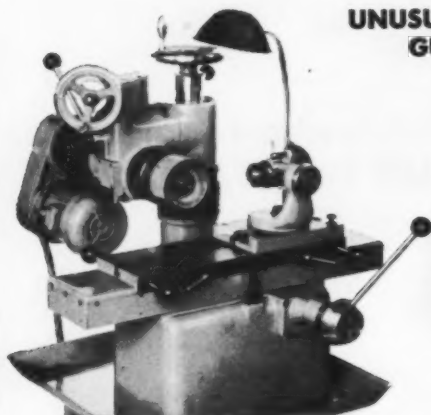
**PRESSES, Trimming**

Alva Allen Industries, Clinton, Mo.  
 Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.  
 Bliss, E. W. Co., 1375 Raff Rd., S. W., Canton, Ohio  
 Chambersburg Engineering Co., Chambersburg, Pa.  
 Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.  
 Cleveland Punch & Shear Wks. Co., 3917 St. Clair Ave., Cleveland 14, Ohio  
 Danly Machine Specialties, Inc., 2100 S. Laramie, Chicago 50, Ill.  
 Elmes Eng. Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio  
 Federal Machine & Welder Co., 1745 Overland Ave., N. E., Warren, Ohio  
 Federal Press Co., 511 Division St., Elkhart, Ind.  
 Ferracute Machine Co., Bridgeton, N. J.  
 Hannifin Corp., 510 S. Wolf Rd., Des Plaines, Ill.  
 Hydraulic Press Mfg. Co., Mount Gilead, Ohio  
 L & J Press Corp., 1631 Sterling Ave., Elkhart, Ind.  
 Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.  
 Minster Machine Co., Minster, Ohio  
 Niagara Machine & Tool Wks., 637 Northland Ave., Buffalo 11, N. Y.  
 Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.  
 Wilson, K. R., Inc., Arcade, N. Y.

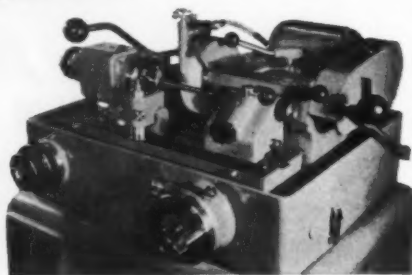
**PROFILING MACHINES**—See Milling Machine, Die Sinking, etc.

**PULLEYS**

Brown & Sharpe Mfg. Co., Providence, R. I.  
 Delta Power Tool Div., Rockwell Mfg. Co., Pittsburgh, Pa.



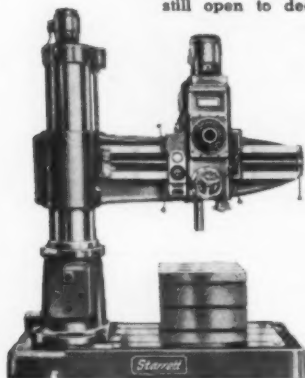
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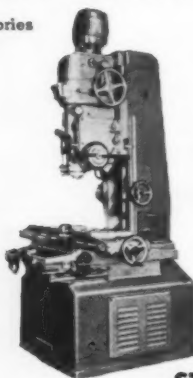
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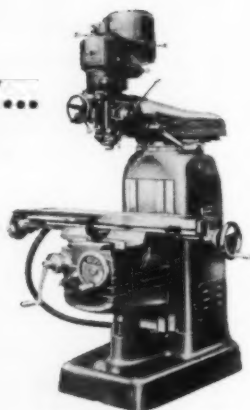
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Graymills Co., 3705 N. Lincoln Ave., Evans-  
ton, Ill.  
Ingersoll-Rand Co., Phillipsburg, N. J.  
Logansport Machine Co., Inc., 810 Center  
Ave., Logansport, Ind.  
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Cincinnati 12, Ohio  
Viking Pump Co., Cedar Falls, Iowa

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Barnes, John S., Corp., Rockford, Ill.  
Brown & Sharpe Mfg. Co., Providence, R. I.  
Denison Engrg. Co., 1160 Dublin St., Columbus  
16, Ohio  
Elmes Eng. Div., American Steel Foundries,  
1150 Tennessee Ave., Cincinnati 29, Ohio  
Hydraulic Press Mfg. Div., Mount Gilead, Ohio  
Oilgear Co., 1569 W. Pierce St., Milwaukee,  
Wis.  
Sundstrand Machine Tool Co., 2531 11th St.,  
Rockford, Ill.  
Vickers Incorporated, Division of Sperry Rand  
Corp., 1402 Oakman Blvd., Detroit, Mich.  
Viking Pump Co., Cedar Falls, Iowa  
Watson-Stillman Co., Roselle, N. J.  
Wilson, K. R., Arcade, N. Y.

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ing, etc.****REAMERS, Rose, Chucking, Jobbers'  
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Chicago-Latrobe, 411 W. Ontario St., Chicago  
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Cleveland, Ohio  
DoAll Co., 254 N. Laurel Ave., Des Plaines,  
Ill.  
Greenfield Tap & Die Corp., Greenfield, Mass.  
Heller Tool Co., Heller Dr., Newcomerstown,  
Ohio  
National Twist Drill & Tool Co., & Winter  
Bros. Co., Rochester, Mich.  
Tomkins-Johnson Co., 617 N. Mechanic St.,  
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Whitman & Barnes, 40600 Plymouth Rd.,  
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Ill.  
Russell, Holbrook & Henderson, Inc., 292 Madison  
Ave., New York 17, N. Y.  
Tomkins-Johnson Co., 617 N. Mechanic St.,  
Jackson, Mich.

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Ill.  
Ingersoll-Rand Co., 11 Broadway, New York 4,  
N. Y.  
Thor Power Tool Co., Prudential Plaza, Chi-  
cago 1, Ill.

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Scherr, George Co., Inc., 200 Lafayette St.,  
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Stuart, D. A. Oil Co. Ltd., 2727 S. Troy St.,  
Chicago 23, Ill.  
Sun Oil Co., 1608 Walnut St., Philadelphia 3,  
Pa.

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Cleaning Equipment****SAW BLADES, Hack, Band, Circular,  
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dale Ave., Chicago, Ill.

Circular Tool Co., Inc., 765 Allens Ave., Provi-  
dence 5, R. I.  
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.  
Espin-Lucas Mach. Works, Philadelphia, Pa.  
Simonds Saw & Steel Co., 470 Main St., Fitch-  
burg, Mass.  
Starrett, The L. S. Co., Athol, Mass.  
Tannewitz Works, Grand Rapids, Mich.

**SAW BLADE SHARPENERS**

DoAll Co., Des Plaines, Ill.  
Espin-Lucas Machine Works, Front St. and  
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Scherr, George Co., Inc., 200 Lafayette St.,  
New York 12, N. Y.

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Aaron Machinery Co., Inc., 45 Crosby St., New York 12, N. Y.  
 Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.  
 Delta Power Tool Div., Rockwell Mfg. Co., Pittsburgh, Pa.  
 DoAll Co., 254 Laurel Ave., Des Plaines, Ill.  
 Famco Machine Co., Kenosha, Wis.  
 Tannewitz Works, Grand Rapids, Mich.

**SAWING MACHINES, Circular Blade**

Consolidated Mch. Tool Div., Blossom Road, Rochester 10, N. Y.  
 Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.  
 DoAll Co., 254 Laurel Ave., Des Plaines, Ill.  
 Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.

**SAWING MACHINES, Power Hack**

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.  
 Chicago Pneumatic Tool Co., New York 17, N. Y.  
 Homstrand, Inc., Larchmont, N. Y.  
 Racine Hydraulics & Machinery Inc., Racine, Wis.  
 Thor Power Tool Co., Prudential Plaza, Chicago 1, Ill.

**SAWS, Screw-slotting—See Cutters, Milling****SCALES**

Hydroway Scales, Inc., 31302 Stephenson Hwy., Madison Hts., Mich.

**SCREW DRIVERS, STUD AND NUT SETTERS, Power**

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.  
 Consolidated Mch. Tool Div., Blossom Road, Rochester 10, N. Y.  
 Cross Co., 3250 Bellevue, Detroit 7, Mich.

Errington Mech. Lab, Inc., 24 Norwood Ave., Staten Island 4, N. Y.  
 Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.  
 Scully-Jones & Co., 1906 S. Rockwell St., Chicago 8, Ill.  
 Thor Power Tool Co., Prudential Plaza, Chicago 1, Ill.  
 Williams & Co., J. H., 400 Vulcan St., Buffalo 7, N. Y.

**SCREW MACHINES, Hand—See Lathes, Turret, Ram-type, Saddle-type****SCREW MACHINES, Single-Spindle Automatic**

Aaron Machinery Co., Inc., 45 Crosby St., New York 12, N. Y.  
 Brown & Sharpe Mfg. Co., Providence, R. I.  
 Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio  
 Cone Automatic Mch. Co., Inc., Windsor, Vt.  
 Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
 Gear Grinding Mch. Co., 3901 Christopher St., Detroit 11, Mich.  
 Gisholt Mch. Co., 1245 E. Washington Ave., Madison 10, Wis.  
 Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.  
 National Acme Co., 170 E. 131st St., Cleveland, Ohio  
 New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.  
 Russell, Halbrock & Henderson, Inc., 292 Madison Ave., New York 17, N. Y.

**SCREW MACHINES, Multiple-Spindle Automatic**

Cone Automatic Mch. Co., Inc., Windsor, Vt.  
 Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
 Greenlee Bros. & Co., 2136 12th St., Rockford, Ill.  
 National Acme Co., 170 E. 131st St., Cleveland, Ohio  
 New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.  
 Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.  
 Warner & Swasey, 6701 Carnegie Ave., Cleveland 3, Ohio

**SCREW PLATES**

Greenfield Tap & Die Corp., Greenfield, Mass.

**SCREWS, Cap, Set, Self-tapping, etc.—See Bolts, Nuts and Screws****SEALS AND RETAINERS, Oil or Grease**

Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill.  
 Gits Bros. Mfg. Co., 1858 S. Kilbourn Ave., Chicago, Illinois

**SEPARATORS, Magnetic**

Barnes Drill Co., 814 Chestnut St., Rockford, Ill.  
 Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

**SET-UP EQUIPMENT**

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.  
 Challenge Mch. Co., Grand Haven, Mich.  
 Lufkin Rule Co., Sapinaw, Mich.  
 Starrett, The L. S. Co., Athol, Mass.  
 Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

**SHAFTS**

Cumberland Steel Co., 101 Williams St., Cumberland, Md.  
 Thomson Ind., Inc., Manhasset, N. Y.

**SHAPERS, Crank and Hydraulic**

Austin Industrial Corp., 76 Mamaronck Ave., White Plains, N. Y.  
 Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio  
 Homstrand, Inc., Larchmont, N. Y.  
 Urban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.  
 Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.  
 Sheldon Mch. Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.  
 South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.  
 Western Machine Tool Works, Holland, Mich.

**SHAPERS, Vertical and Slotters**

Austin Industrial Corp., 76 Mamaronck Ave., White Plains, N. Y.  
 Bridgeport Mch. Co., Inc., 500 Lindley St., Bridgeport 6, Conn.  
 Consolidated Mch. Tool Div., Blossom Road, Rochester 10, N. Y.  
 Homstrand, Inc., Larchmont, N. Y.  
 Morey Machinery Co., 383 Lafayette St., New York 3, N. Y.  
 Urban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.  
 Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.

**SHEARS, Alligator**

Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio  
 Lodge & Shipley Co., The, Cincinnati 25, Ohio

**SHEARS, Rotary and Squaring**

Birdsboro Steel Fdy. & Mch. Co., Birdsboro, Pa.  
 Cincinnati Shaper Co., Hopple & Garrard, Cincinnati 25, Ohio  
 Lodge & Shipley Co., The, Cincinnati 25, Ohio  
 Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.  
 Simonds Saw & Steel Co. (Knives), 470 Main St., Fitchburg, Mass.

**SHEARS, Squaring**

Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio  
 Famco Machine Co., Kenosha, Wis.  
 Lodge & Shipley Co., The, Cincinnati 25, Ohio  
 Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.  
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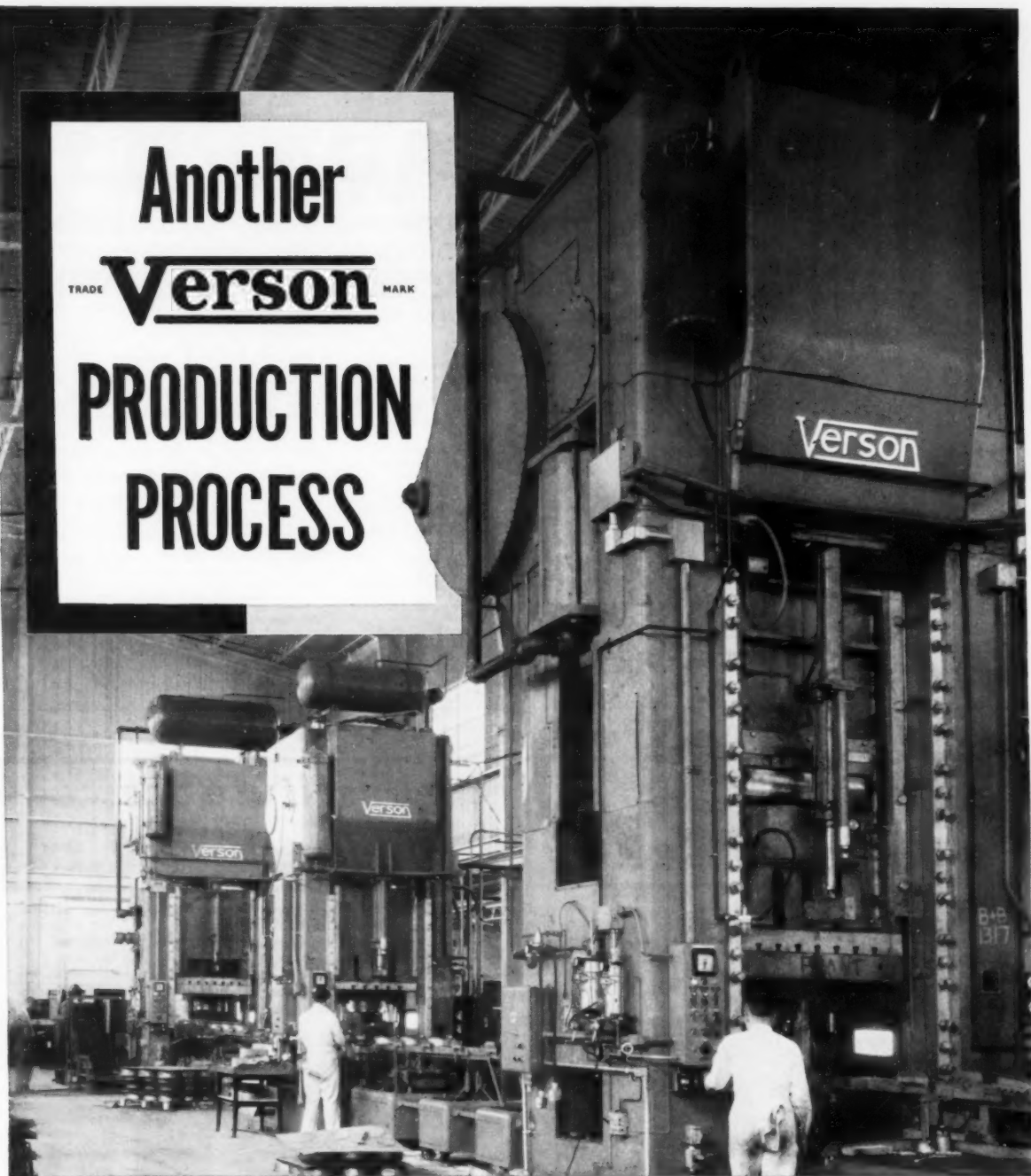
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Engineered and Developed by **-Version-**

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As a manufacturer of both Transmat and automated press line processes and related tooling, Version is well qualified to assist you in high production automatic stamping problems. For specific recommendations send an outline of your requirements.

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For more information fill in page number on Inquiry Card, on page 237

MACHINERY, October, 1957—351

**SHEET METALS**—See Strip and Sheet, Ferrous, Non-ferrous

#### SHIM STOCK

Laminated Shim Co., Inc., Glenbrook, Conn.  
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.

**SHOP FURNITURE**—See Furniture, Shop

#### SLITTING MACHINES, Rotary

Bliss Co., E. W., Canton, Ohio  
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo 11, N. Y.  
Yoder Co., 5504 Walworth Ave., Cleveland 2, Ohio

**SLOTTERS**—See Shapers, Vertical and Slotters

**SOCKETS**—See Drill Sleeves and Extension Holders

#### SOLENOIDS

Allen-Bradley Co., 1331 S. 1st St., Milwaukee 4, Wis.  
Barnes, John S. Corp., Rockford, Ill.  
General Electric Co., Schenectady, N. Y.  
National Acme Co., 170 E. 131st St., Cleveland 3, Ohio  
Vickers, Inc., Detroit 32, Mich.

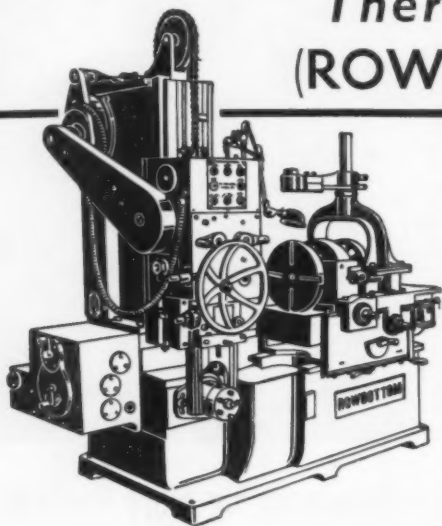
#### SPECIAL MACHINERY AND TOOLS

Axelsson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Calif.  
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.  
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.  
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio  
Baker Bros., Inc., Sta. F., P.O. Box 101, Toledo 10, Ohio  
Bath, Cyril Co., Aurora & Solon Road, Solon, Ohio  
Barnes Drill Co., 814 Chestnut, Rockford, Ill.  
Barnes, W. F. & John Co., 201 S. Water St., Rockford, Ill.  
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.  
Bethlehem Steel Co., Bethlehem, Pa.  
Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.  
Birdsboro Steel Fdy. & Mch. Co., Birdsboro, Pa.  
Blanchard Mch. Co., 64 State St., Cambridge, Mass.  
Bliss, E. W. Co., 1375 Raff Rd., S. W., Canton, Ohio  
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.  
Chambersburg Engrg. Co., Chambersburg, Pa.  
Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio  
Colonial Broach & Machine Co., P.O. Box 37, Harper Sta., Detroit 13, Mich.  
Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio  
Consolidated Mch. Tool Corp., Rochester, N. Y.  
Coulter, James, Machine Co., Bridgeport 5, Conn.  
Cross Co., Detroit, Mich.  
Erie Foundry Co., Erie, Pa.  
Espin-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa.  
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.  
Federal Machine & Welder Co., Overland Ave., Warren, Ohio  
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.  
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.

Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.  
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.  
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.  
Hartford Special Mchry. Co., 287 Homestead Ave., Hartford, Conn.  
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio  
Hydraulic Press Mfg. Co., Mount Gilead, Ohio  
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.  
Kingsbury Mch. Tool Corp., Keene, N. H.  
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.  
Le Maire Tool & Mfg. Co., Dearborn, Mich.  
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.  
Modern Industrial Engrg. Co., 14230 Birwood, Detroit 4, Mich.  
Moline Tool Co., 102 20th St., Moline, Ill.  
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio  
National Acme Co., 170 E. 131st St., Cleveland, Ohio  
National Automatic Tool Co., Inc., 5. 7th and N. Sts., Richmond, Ind.  
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.  
National Twist Drill & Tool Co., Rochester, Mich.  
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.  
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.  
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.  
Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.  
Robbins, Omer E. Co., 24800 Plymouth Rd., Detroit 39, Mich.  
Seneca Falls Mch. Co., Seneca Falls, N. Y.  
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.  
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio  
Sundstrand Mch. & Tool Co., 2531 11th St., Rockford, Ill.  
Universal Engrg. Co., Frankenthuth 2, Mich.  
Verson Allsteel Press Co., 93rd St., & 5. Kenwood Ave., Chicago, Ill.

(Continued on page 354)

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When an organization, (such as Rowbottom), gears its entire staff of men and machines to specialize on CAMS... plus the MACHINES TO PRODUCE THEM... and when such an organization has been in this business building its reputation in this field and this one field alone for more than half a century, with a healthy growth over the years... you can be certain that service to its customers has been absolutely satisfactory. In the metal-working field this means strictest adherence to material specifications, tolerances and, in today's market, low production costs.

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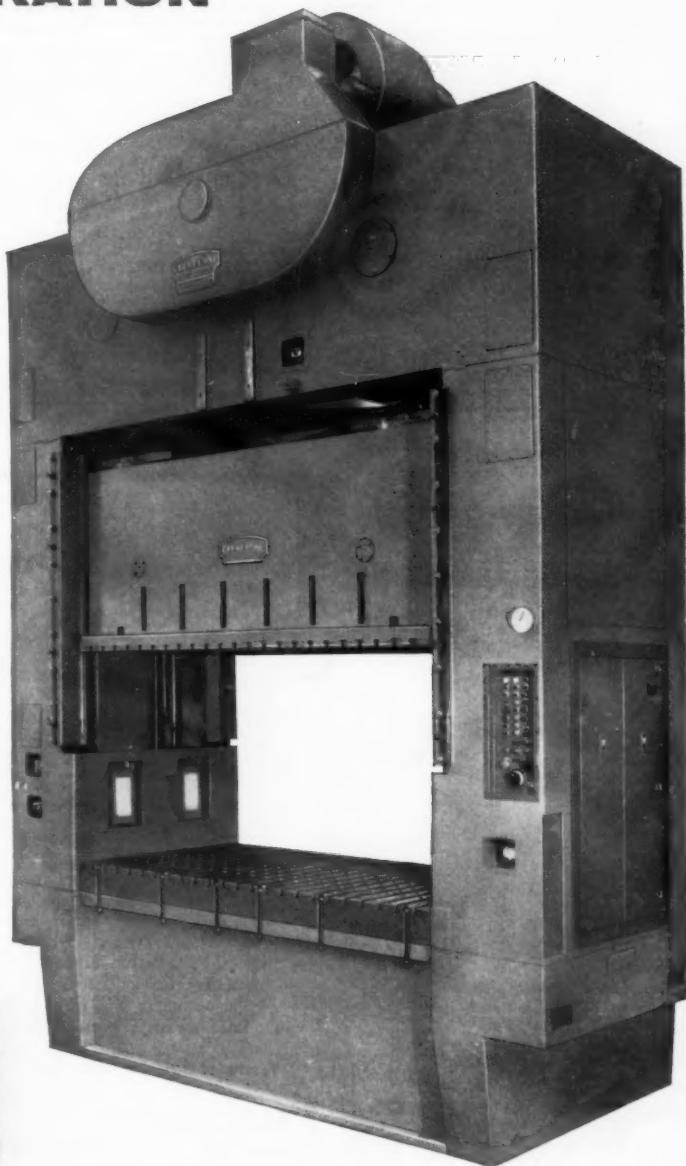
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Features on this press are:

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- Auxiliary air brake on flywheel
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500-ton capacity,  
24" stroke with 15"  
adjustment; shut-height  
61½"; slide and bed both  
72" x 144".

AA-213

For more information fill in page number on Inquiry Card, on page 237

MACHINERY, October, 1957—353



Waltham Machine Works, Newton St., Waltham, Mass.  
 Wicaco Machine Corp., Wayne Junction, Philadelphia, Pa.

**SPEED REDUCERS**

Barnes, John S. Corp., Rockford, Ill.  
 Boston Gear Works, 320 Main St., North Quincy 71, Mass.  
 Brad Foote Gear Works, 1309 So. Cicero Ave., Chicago 50, Ill.  
 Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland, Ohio  
 Cone Drive Gear Div., 7171 E. McNichols Rd., Detroit 12, Mich.  
 DoAll Co., Des Plaines, Ill.  
 Farrell-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.  
 General Electric Co., Schenectady, N. Y.  
 Horsburgh & Scott Co., 5114 Hamilton, Cleveland, Ohio  
 James, D. O., Gear Mfg. Co., 1140 W. Monroe St., Chicago 7, Ill.  
 Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.  
 Reliance Elec. & Engrg. Co., 1200 Ivanhoe Rd., Cleveland 10, Ohio

**SPINDLES, Machine**

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
 National Automatic Tool Co., S. 7th and N. St., Richmond, Ind.  
 Standard Electrical Tool Co., 2488-90 River Road, Cincinnati, Ohio  
 Wadell Equip. Co., Clark, N. J.

**SPRAYING EQUIPMENT, Metal**

Metallizing Engrs. Co., Westbury, N. Y.

**SPROCKETS—See Gears, Cut****STAMPINGS, Sheet Metal**

Dayton Rogers Mfg. Co., Minneapolis, Minn.  
 Laminated Shim Co., Inc., Glenbrook, Conn.  
 Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

**STEEL ALLOYS—See Alloy Steels****STEEL, Cold Rolled, Stainless, High-speed, Tool, etc.**

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.  
 Bethlehem Steel Co., Bethlehem, Pa.  
 Carpenter Steel Co., 105 W. Bern St., Reading, Pa.  
 Columbia Tool Steel Co., Chicago Hts., Ill.  
 Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa.  
 Cumberland Steel Co., 101 Williams St., Cumberland, Md.  
 Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago 18, Ill.  
 Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.  
 Timken Roller Bearing Co., Canton, Ohio  
 U. S. Steel Corp. (American Steel & Wire Co.), Div., 436 7th Ave., Pittsburgh, Pa.  
 Vanadium-Alloys Steel Co., Latrobe, Pa.  
 Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

**STEEL DISTRIBUTORS**

Ryerson, Jos. T., & Son, 16th & Rockwell St., Chicago 8, Ill.

**STOCKS AND DIES**

Cyril Bath Co., Solon, Ohio  
 DoAll Co., Des Plaines, Ill.  
 Greenfield Tap & Die Corp., Greenfield, Mass.  
 Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio  
 Landis Mch. Co., Waynesboro, Pa.  
 Threadwell Tap & Die Co., Greenfield, Mass.

**STRAIGHTEDGES—See Machinists' Small Tools****STRAIGHTENERS, Flat Stock and Wire**

Bliss Co., E. W., Canton, Ohio  
 Niagara Mch. & Tool Wks., 637-697 Northland Ave., Buffalo 11, N. Y.  
 Nilson, A. H. Machine Co., Bridgeport, Conn.  
 U. S. Tool Co., Inc., 255 North 18th St., Amherst, N. J.  
 Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.

**STRIP AND SHEET, Ferrous**

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.  
 Bethlehem Steel Co., Bethlehem, Pa.  
 Carpenter Steel Co., 105 W. Bern St., Reading, Pa.  
 Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa.  
 Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago 18, Ill.  
 U. S. Steel Corp. (American Steel & Wire Co.), Div., Carnegie-Illinois Steel Corp., Div., Columbia Steel Co., Div., Tennessee Coal, Iron & R. R. Co., Div., 436 7th Ave., Pittsburgh, Pa.

**STRIP AND SHEET, Non-ferrous**

American Brass Co., 25 Broadway, New York, N. Y.  
 Bethlehem Steel Co., Bethlehem, Pa.  
 Bridgeport Brass Co., Bridgeport, Conn.  
 New Jersey Zinc Co., 160 Front St., New York, N. Y.  
 Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago 18, Ill.

**STRUCTURAL SHAPES**

Bethlehem Steel Co., Bethlehem, Pa.  
 Revere Copper & Brass, Inc., 230 Park Ave., New York 17, N. Y.  
 Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.  
 U. S. Steel Corp., 525 Wm. Penn Pl., Pittsburgh 30, Pa.

**STUD SETTERS—See Screwdrivers, etc.****SUPERFINISHING EQUIPMENT**

Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.

**SURFACE PLATES**

Brown & Sharpe Mfg. Co., 235 Promenade St., Providence 1, R. I.  
 Bryant Chucking Grinder Co., Springfield, Vt.  
 Challenge Mch. Co., Grand Haven, Mich.  
 Delta Power Tool Div., Rockwell Mfg. Co., Pittsburgh, Pa.  
 DoAll Co., Des Plaines, Ill.  
 South Bend Lathe Wks., South Bend 22, Ind.

**SWITCHES, Limit**

Allen-Bradley Co., 1331 So. 1st St., Milwaukee, Wis.

**TACHOMETERS—See Indicators, Speed****TAP HOLDERS**

Brown & Sharpe Mfg. Co., 235 Promenade St., Providence 1, R. I.  
 Cleveland Automatic Mch. Co., 4932 Beech St., Cincinnati 12, Ohio  
 Etico Tool Co., Inc., 594 Johnson Ave., Brooklyn 37, N. Y.  
 Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
 National Automatic Tool Co., S. 7th and N. Sts., Richmond, Ind.  
 Scully-Jones & Co., 1906 Rockwell St., Chicago 8, Ill.

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Illustrated is a Model A-20-2-HC Test Unit manufactured by Cincinnati Sub Zero Products and equipped with a Model TL-7320 Gusher Pump.

**Ruthman**

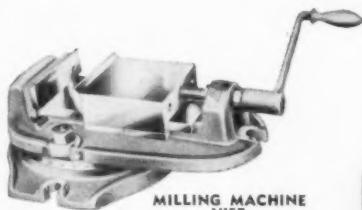
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Many shops have modernized their production by replacing obsolete equipment with BRIDGEPORT MILLERS . . . the machines that mill, drill, bore and shape at all angles with one set-up.

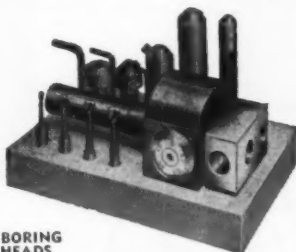
These shops planned for the future when they installed "BRIDGEPORTS" in their tool rooms, die shops and production lines. They were convinced by the experience of others that their moderate investment in modernization would be returned quickly through economies they could effect, and that obsolescence would be deferred for many years to come.

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**MILLING MACHINE  
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Improved and providing great gripping power with large diameter jaws for rigid holding. Streamlined for appearance and equipped with coolant trough. Two sizes: 5" x 3 1/2" and 6" x 5" jaw openings.



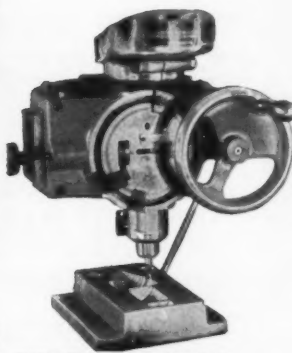
**BORING  
HEADS**

Made in two sizes. Boring Tools and Holder provide means for boring holes up to 6" diameter; available for use on Bridgeport 1 HP Milling, Drilling and Boring Attachment.



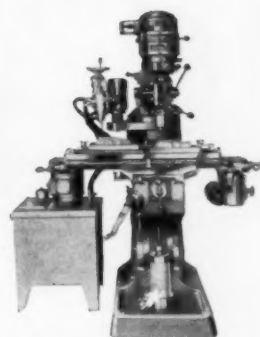
**RIGHT ANGLE  
ATTACHMENTS**

Heavy Duty (shown here) for milling and drilling at right angles . . . Fits both Master and 1 HP heads. Also Light Duty for right angle drilling of deep molds and cavities . . . Fits Master Head only.



**CHERRYING ATTACHMENT**

Makes possible production of convex and concave shapes; ideal for producing drop forging dies, molds, cavities.



**TRUE TRACE COMBINATION**

The Bridgeport True Trace Combination gives excellent performance and saves endless hours when copying irregular dies and molds.

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Bridgeport, Connecticut

Manufacturers of High Speed Milling Attachments and Turret Milling Machines

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Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio  
 Davis Boring Tool Div., Giddings & Lewis Mch. Tool Co., Fond du Lac, Wis.  
 Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, Staten Island, N. Y.  
 Etico Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.  
 Homestrand Inc., Larchmont, N. Y.  
 LaSalle Tool, Inc., 3480 E. Outer Drive, Detroit 34, Mich.  
 Leland-Gifford Co., 1425 Southbridge St., Worcester, Mass.  
 National Automatic Tool Co., S. 7th and N Sts., Richmond, Ind.  
 Thriftmaster Products Corp., 1076 N. Plum St., Lancaster, Pa.

## TAPPING MACHINES

Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio  
 Baush Machine Tool Co., 15 Wason Ave., Springfield 7, Mass.  
 Cincinnati Bickford Div. of Giddings & Lewis Mch. Tool Co., Oakley, Cincinnati 9, Ohio  
 Chicago Pneumatic Tool Co., New York 17, N. Y.  
 Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.  
 Elox Corp. of Mich., 1830 Stephenson Highway, Royal Oak 3, Mich.  
 Etico Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.  
 Govro-Nelson Co., 1831 Antoinette St., Detroit 8, Mich.  
 Hamilton Tool Co., 834 S. 9th St., Hamilton, Ohio  
 Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio  
 Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.  
 Kaufman Manufacturing Co., Manitowac, Wis.  
 Kingsbury Mch. Tool Corp., Keene, N. H.  
 Landis Mch. Co., Waynesboro, Pa.  
 LaSalle Tool Inc., 3840 E. Outer Drive, Detroit 34, Mich.  
 Le Maire Tool & Mfg. Co., Dearborn, Mich.  
 Maline Tool Co., 102 20th St., Moline, Ill.

National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.  
 Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio  
 Western Machine Tool Works, Holland, Mich.

## TAPS, Hand, Machine Screw, Pipe, et

DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.  
 Greenfield Tap & Die Corp., Greenfield, Mass.  
 Hanson-Whitney Co., 169 Bartholomew Ave., Hartford 3, Conn.  
 Hy-Pro Tool Co., New Bedford, Mass.  
 Sheffield Corp., 721 Springfield St., Dayton 1, Ohio  
 Threadwell Tap & Die Co., Greenfield, Mass.  
 Winter Bros. Co., Rochester, Mich.

## TAPS, Collapsing

Geometric Tool Co. Div., Greenfield Tap & Die Corp., New Haven 15, Conn.  
 Greenfield Tap & Die Corp., Greenfield, Mass.  
 Landis Mch. Co., Waynesboro, Pa.  
 National Acme Co., 170 E. 131st St., Cleveland, Ohio  
 Sheffield Corp., 721 Springfield St., Dayton 1, Ohio

## THREAD CUTTING MACHINES

Davis & Thompson Co., 4460 W. 124th St., Milwaukee 10, Wis.  
 Eastern Mch. Screw Corp., New Haven, Conn.  
 Errington Mch. Lab. Inc., 24 Norwood Ave., Staten Island 4, N. Y.  
 Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio  
 Landis Mch. Co., Waynesboro, Pa.  
 Sheffield Corp., Dayton 1, Ohio

## THREAD CUTTING TOOLS

Armstrong Bros. Tool Co., 5200 Armstrong Ave., Chicago, Ill.

Eastern Mch. Screw Corp., New Haven, Conn.  
 Geometric Tool Co. Div., Greenfield Tap & Die Corp., New Haven 15, Conn.  
 Hanson-Whitney Co., 169 Bartholomew Ave., Hartford 3, Conn.  
 Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio  
 Landis Mch. Co., Waynesboro, Pa.  
 Sheffield Corp., 721 Springfield St., Dayton 1, Ohio

## THREAD ROLLING DIES—See Dies, Thread Rolling

## THREAD ROLLING EQUIPMENT

Hartford Special Machinery Co., 287 Homestead Ave., Hartford, Conn.  
 Landis Machine Co., Waynesboro, Pa.  
 National Acme Co., 170 E. 131st St., Cleveland 3, Ohio  
 National Machinery Co., Tiffin, Ohio  
 Reed Rolled Thread Die Co., P. O. Box 350, Worcester 1, Mass.  
 Sheffield Corp., Dayton 1, Ohio  
 V & O Press Co., Hudson, New York

## TOOL CONTROL BOARDS

Cross Co., 3250 Bellevue, Detroit 7, Mich.  
 Royal Design & Mfg. Inc., 4133 E. 10 Mile Rd., Centerline, Mich.  
 Scully-Jones Co., 1906 S. Rockwell St., Chicago 8, Ill.

## TOOL HOLDERS

Apex Tool & Cutter Co., Inc., 235 Canal St., Shelton, Conn.  
 Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.  
 Bridgeport Mch. Inc., 500 Lindley St., Bridgeport 6, Conn.  
 Cleveland Automatic Mch. Co., 4932 Beech St., Cincinnati 12, Ohio  
 Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio  
 Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.  
 Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.  
 Eastern Mch. Screw Corp., Truman & Barclay Sts., New Haven 6, Conn.  
 Eclipse Counterbore Co., 1600 Bonner Ave., Ferndale, Mich.  
 Kennametal Inc., Latrobe, Penna.  
 Lovejoy Tool Co., Inc., Springfield, Vt.  
 Metal Carbides Corp., 6001 Southern Blvd., Youngstown 12, Ohio  
 R & L Tools, 1825 Bristol St., Philadelphia 40, Pa.  
 Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.  
 Vascoloy-Ramet Corp., Waukegan, Ill.  
 Walton Co., Hartford 10, Conn.  
 Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.  
 Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

## TOOL MATERIAL, Cast Non-Ferrous Alloy

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.  
 Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.  
 Haynes Stellite Co., 725 So. Lindsay St., Kokomo, Ind.  
 Lovejoy Tool Co., Inc., Springfield, Vt.  
 Vascoloy-Ramet Corp., Waukegan, Ill.

## TOOL MATERIAL, Cemented Carbide

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.  
 Apex Tool & Cutter Co., Inc., 235 Canal St., Shelton, Conn.  
 Armstrong Bros. Tool Co., 5213 W. Armstrong Ave., Chicago 30, Ill.  
 Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio  
 DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.  
 Kennametal, Inc., Latrobe, Pa.  
 Lovejoy Tool Co., Inc., Springfield, Vt.  
 Metal Carbides Corp., Youngstown 12, Ohio  
 Valenite Metals Corp., Royal Oak, Mich.  
 Vascoloy-Ramet Corp., Waukegan, Ill.  
 Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

## TOOL MATERIAL, Ceramic

Metal Carbides Corp., Youngstown 12, Ohio  
 Norton Co., 1 New Bond St., Worcester 6, Mass.  
 Vascoloy-Ramet Corp., Waukegan, Ill.

## FRICTION SAWING



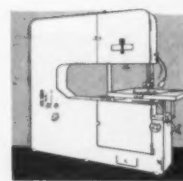
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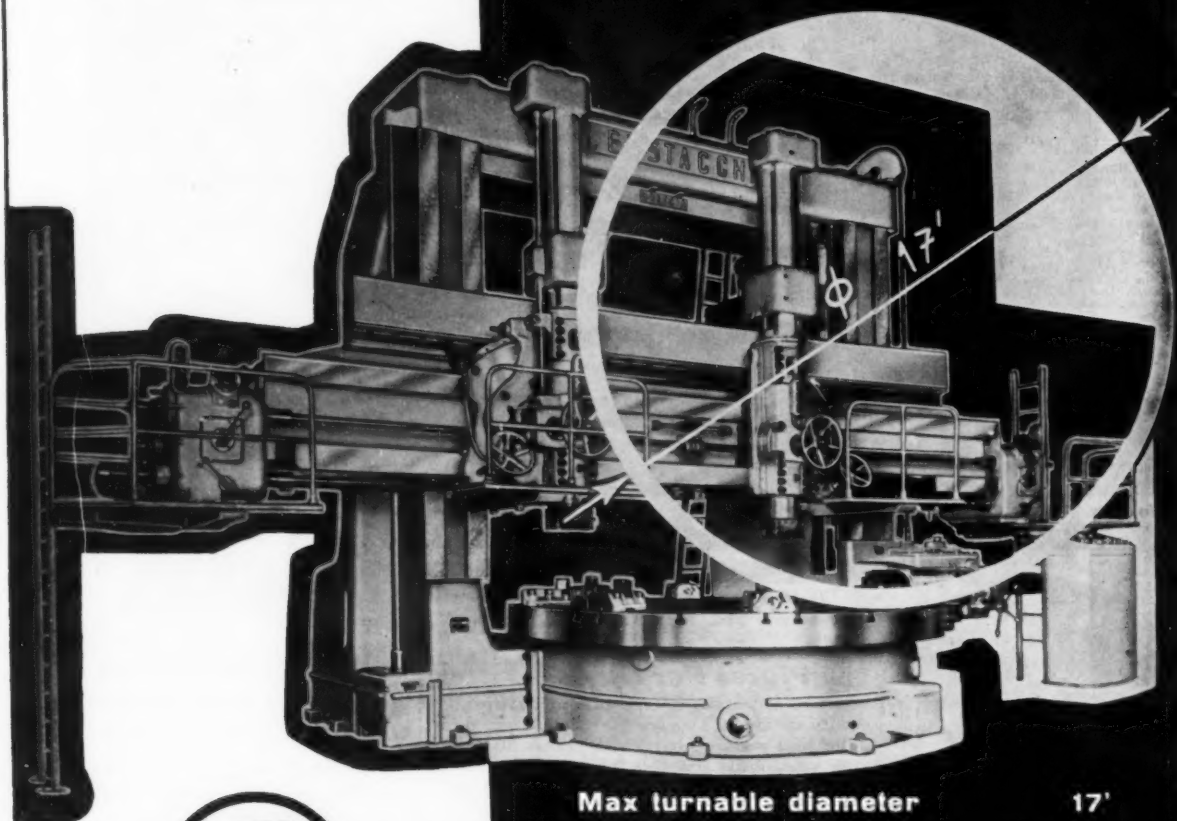
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Apex Tool & Cutter Co., Inc., 235 Canal St.,  
Shelton, Conn.  
Armstrong Bros. Tool Co., 5213 W. Armstrong  
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Carpenter Steel Co., Reading, Pa.  
Cleveland Twist Drill Co., 1242 E. 49th St.,  
Cleveland 14, Ohio  
Crucible Steel Co. of America, Oliver Bldg.,  
Pittsburgh 30, Pa.  
Lovejoy Tool Co., Inc., Springfield, Vt.  
Vanadium Alloys Steel Co., Latrobe, Pa.

**TRACING ATTACHMENTS**

American Tool Works Co., Pearl and Eggleston  
Aves., Cincinnati 2, Ohio.  
Atlas Press Co., Kalamazoo, Mich.  
G & L and Hypro Div., Giddings & Lewis Ma-  
chine Tool Co., Fond du Lac, Wis.  
Gisholt Mch. Co., 1245 E. Washington Ave.,  
Madison 10, Wis.  
Gorton Mch. Co., 1321 Racine St., Racine, Wis.  
Jones & Lamson Mch. Co., 512 Clinton St.,  
Springfield, Vt.  
Sidney Mch. Tool Co., Sidney, Ohio  
Wales-Strippit Co., Akron, N. Y.  
Warner & Swasey, 5701 Carnegie Ave., Cleve-  
land 3, Ohio

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Barnes, John S. Corp., Rockford, Ill.  
Boston Gear Wks., Quincy, Mass.  
Cleveland Worm & Gear Co., 3249 E. 80th St.,  
Cleveland 4, Ohio  
Oilgear Co., 1569 W. Pierce St., Milwaukee,  
Wis.  
Reliance Electric & Engrg. Co., 1047 Ivanhoe  
Rd., Cleveland 10, Ohio  
Vickers, Inc., Detroit 32, Mich.

**TRUCKS, Material Handling**

Hamilton Tool Co., 834 So. 9th St., Hamilton,  
Ohio

**TUBE-FLANGING MACHINES**

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Niagara Mch. & Tool Wks., 637-697 Northland  
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Mueller Brass Co., Port Huron 34, Mich.  
Revere Copper & Brass Inc., 230 Park Ave.,  
New York, N. Y.  
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell  
Sts., Chicago 18, Ill.

**TUBING, Steel**

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.  
Babcock & Wilcox Co., Beaver Falls, Pa.  
Carpenter Steel Co., Reading, Pa.  
Crucible Steel Co. of America, Henry W.  
Oliver Bldg., Melon Square, Pittsburgh 22,  
Pa.

National Tube Div., U. S. Steel Corp., 525 Wm.  
Penn Place, Pittsburgh, Pa.  
Revere Copper & Brass, Inc., 230 Park Ave.,  
New York 17, N. Y.  
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell  
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Timken Roller Bearing Co., Canton, Ohio

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General Electric Co., Schenectady, N. Y.

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Logansport Mch. Co., Inc., Logansport, Ind.  
Philadelphia Gear Works (Motorized), Erie Ave.  
and G St., Philadelphia, Pa.  
Vickers, Inc., Detroit 32, Mich.

**VALVES, Air**

Hannifin Corp., 510 S. Wolf Rd., Des Plaines,  
Ill.  
Hunt, C. B., & Son, Inc., 1911 E. Pershing St.,  
Salem, Ohio  
Hydraulic Press Mfg. Div., Mt. Gilead, Ohio  
Logansport Mch. Co., Inc., Logansport, Ind.  
Mead Specialties Co., 4114 N. Knox Ave., Chi-  
cago 41, Ill.  
Ross Operating Valve Co., 110 E. Golden Gate  
Ave., Detroit 3, Mich.  
Schrader's Son, A., 470 Vanderbilt Ave.,  
Brooklyn 38, N. Y.  
Skinner Chuck Co., 95 Edgewood Ave., New  
Britain, Conn.  
Tomkins-Johnson Co., 617 N. Mechanic St.,  
Jackson, Mich.

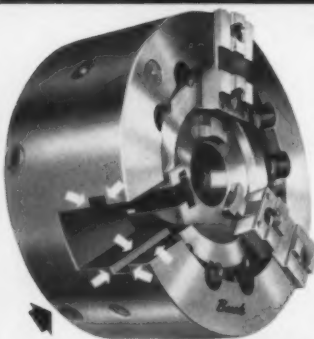
**VALVES, Hydraulic**

Barnes, John S. Corp., Rockford, Ill.  
Denison Engrg. Co., 1160 Dublin St., Columbus,  
16, Ohio  
Elmes Eng. Div., American Steel Foundries,  
1150 Tennessee Ave., Cincinnati 29, Ohio  
Hunt, C. B., & Son, 1911 E. Pershing St.,  
Salem, Ohio  
Hydraulic Press Mfg. Div., Mount Gilead, Ohio  
Logansport Machine, Inc., 810 Center Ave.,  
Logansport, Ind.  
Oilgear Co., 1569 W. Pierce St., Milwaukee,  
Wis.  
Vickers Incorporated, Division of Sperry Rand  
Corp., 1402 Oakman Blvd., Detroit, Mich.  
Watson-Stillman Co., Roselle, N. J.

**VERNIERS—See Calipers, Vernier;  
Gages, Vernier****VICES, Machine**

Bridgeport Mches., Inc., 500 Lindley St.,  
Bridgeport 6, Conn.  
Brown & Sharpe Mfg. Co., Providence, R. I.  
Cincinnati Milling & Grinding Mches., Inc.,  
4701 Marburg Ave., Cincinnati 9, Ohio  
Cincinnati Milling Mch. Co., Oakley, Cincinnati  
9, Ohio  
Delta Power Tool Div., Rockwell Mfg. Co.,  
Pittsburgh, Pa.  
Logansport Machine Co., Inc., 810 Center  
Ave., Logansport, Ind.  
Modern Mch. Tool Co., 2005 Losey Ave.,  
Jackson, Mich.  
Producto Mch. Co., 990 Housatonic Ave.,  
Bridgeport, Conn.  
Universal Engineering Co., Frankenmuth 2,  
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Wesson Co., 1220 Woodward Hts. Blvd., De-  
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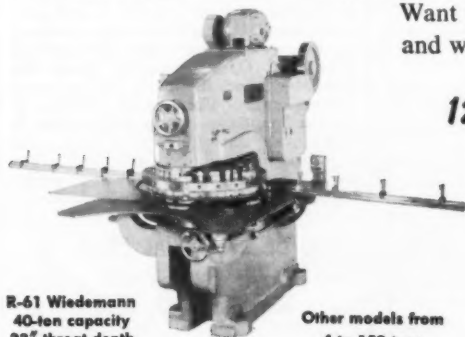
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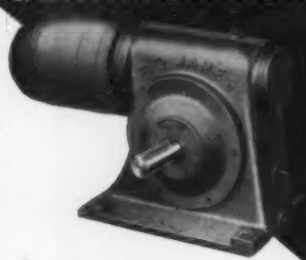
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General Electric Co., Schenectady, N. Y.  
Lincoln Electric Co., 22801 St. Clair Ave., Cleveland, Ohio  
Linde Co., New York 17, N. Y.

## WELDING EQUIPMENT, Gas

Air Reduction Sales Co., 150 E. 42nd St., New York 17, N. Y.  
Linde Co., New York 17, N. Y.

## WELDING EQUIPMENT, Resistance

Eisler Engrg. Co., Inc., 750 South 13th St., Newark, N. J.  
Federal Mch. & Welder Co., Warren, Ohio

## WELDING POSITIONERS

Eisler Engrg. Co., Inc., 750 South 13th St., Newark, N. J.

## WELDMENTS

Bliss, E. W., Co., Canton, Ohio  
Mahon, R. C., Co., Detroit 34, Mich.  
Verson Alsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

## WIPERS

Scott Paper Co., Chester, Pa.

## WIRE

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.  
(Stainless)  
Bethlehem Steel Co., Bethlehem, Pa.  
Carpenter Steel Co., 105 W. Bern St., Reading, Pa.  
Crucible Steel Co. of America, Henry W. Oliver Bldg., Mellon Square, Pittsburgh 22, Pa.  
U. S. Steel Corp., (American Steel & Wire Co. Div. Columbia Steel Co. Div. Tennessee Coal, Iron & R. R. Co. Div.) 436 7th Ave., Pittsburgh, Pa.

## WIRE FORMING MACHINES

Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.  
Coca Corp., 405 Lexington Ave., New York 17, N. Y.  
Eisler Engrg. Co., Inc., 750 South 13th St., Newark, N. J.  
Nilsson, A. H., Machine Co., Bridgeport, Conn.  
U. S. Tool Co., Inc., 255 North 18th St., Amherst, N. J.

## WOODWORKING MACHINES

Atlas Press Co., Kalamazoo, Mich.  
Delta Power Tool Div., Rockwell Mfg. Co., Pittsburgh, Pa.  
Greaves Mch. Tool Div., 2011 Eastern Ave., Cincinnati 2, Ohio  
Greenlee Bros. & Co., 2136 - 12th St., Rockford, Ill.  
Onsrud Machine Works, Inc., Niles, Ill.

## WRENCHES, Allen, End, Socket, Adjustable, etc.

Allen Mfg. Co., 133 Sheldon St., Hartford 2, Conn.  
Armstrong Bros. Tool Co., 5213 W. Armstrong Ave., Chicago, Ill.  
Chicago Pneumatic Tool Co., New York 17, N. Y.  
Standard Pressed Steel Co., Jenkintown, Pa.  
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

## WRENCHES, Power Chuck

Cushman Chuck Co., 806 Windsor St., Hartford 2, Conn.

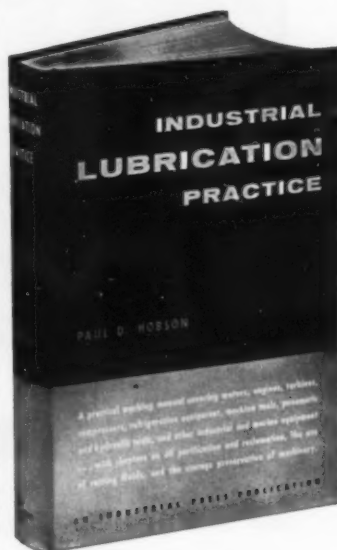
## WRENCHES, Torque

LaSalle Tool, Inc., 3480 E. Outer Drive, Detroit 34, Mich.

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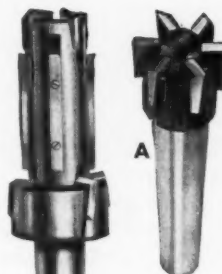
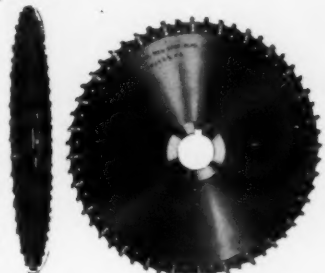
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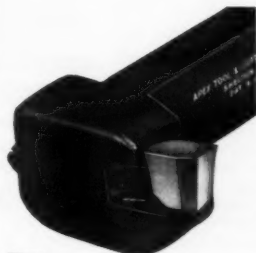
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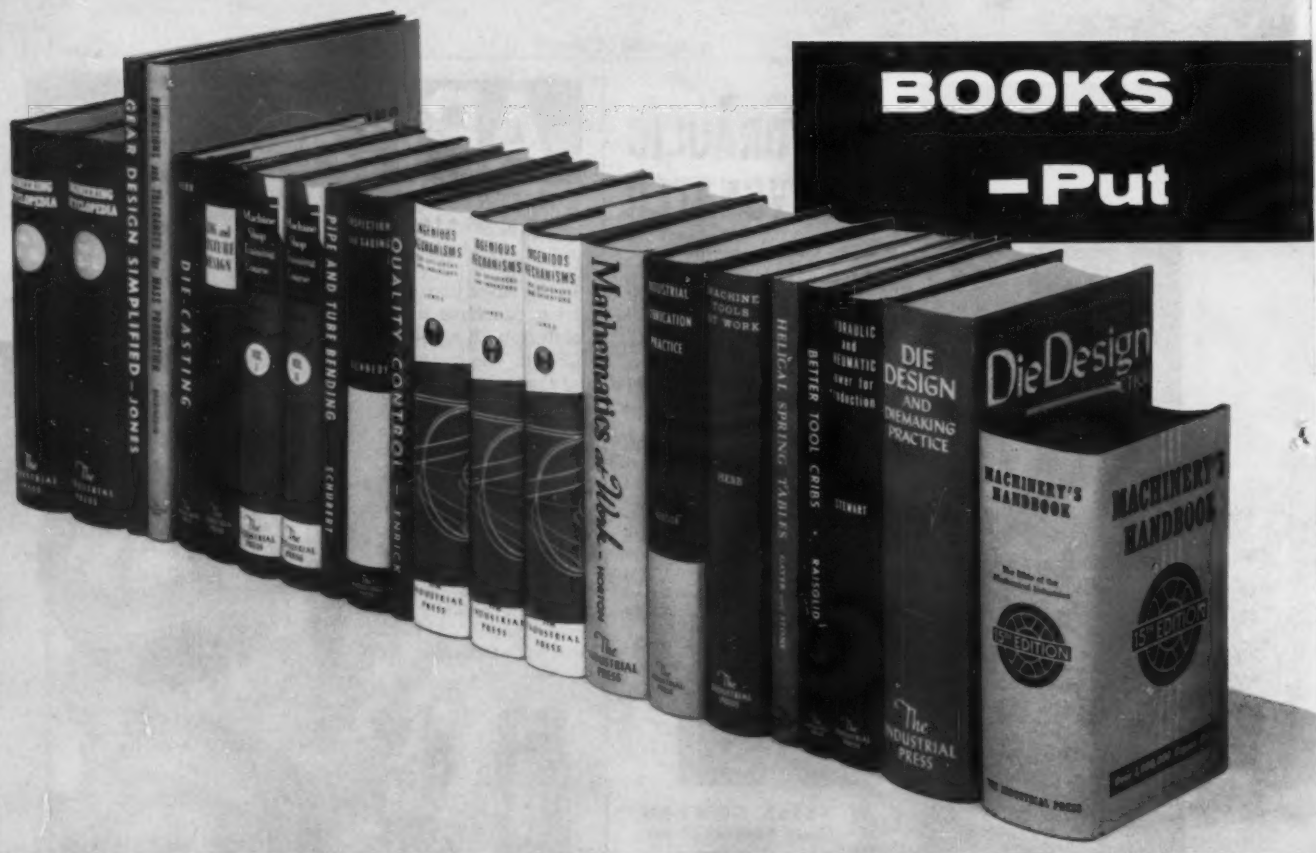
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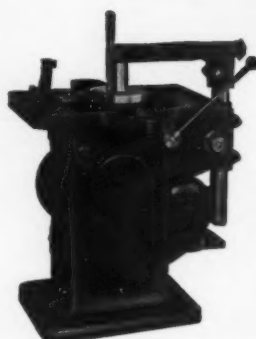
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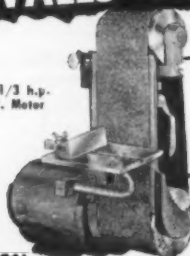
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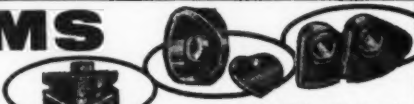
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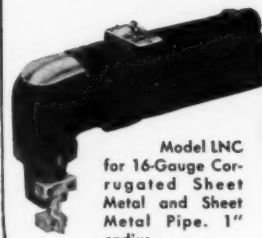
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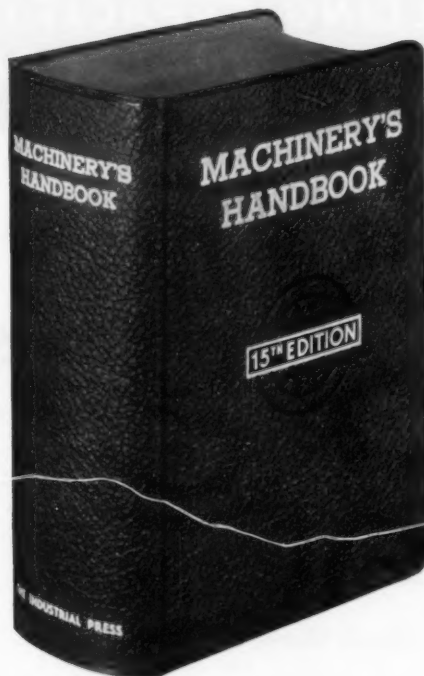
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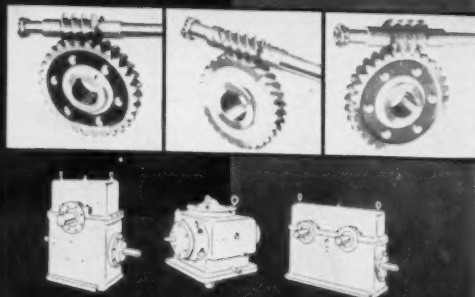
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